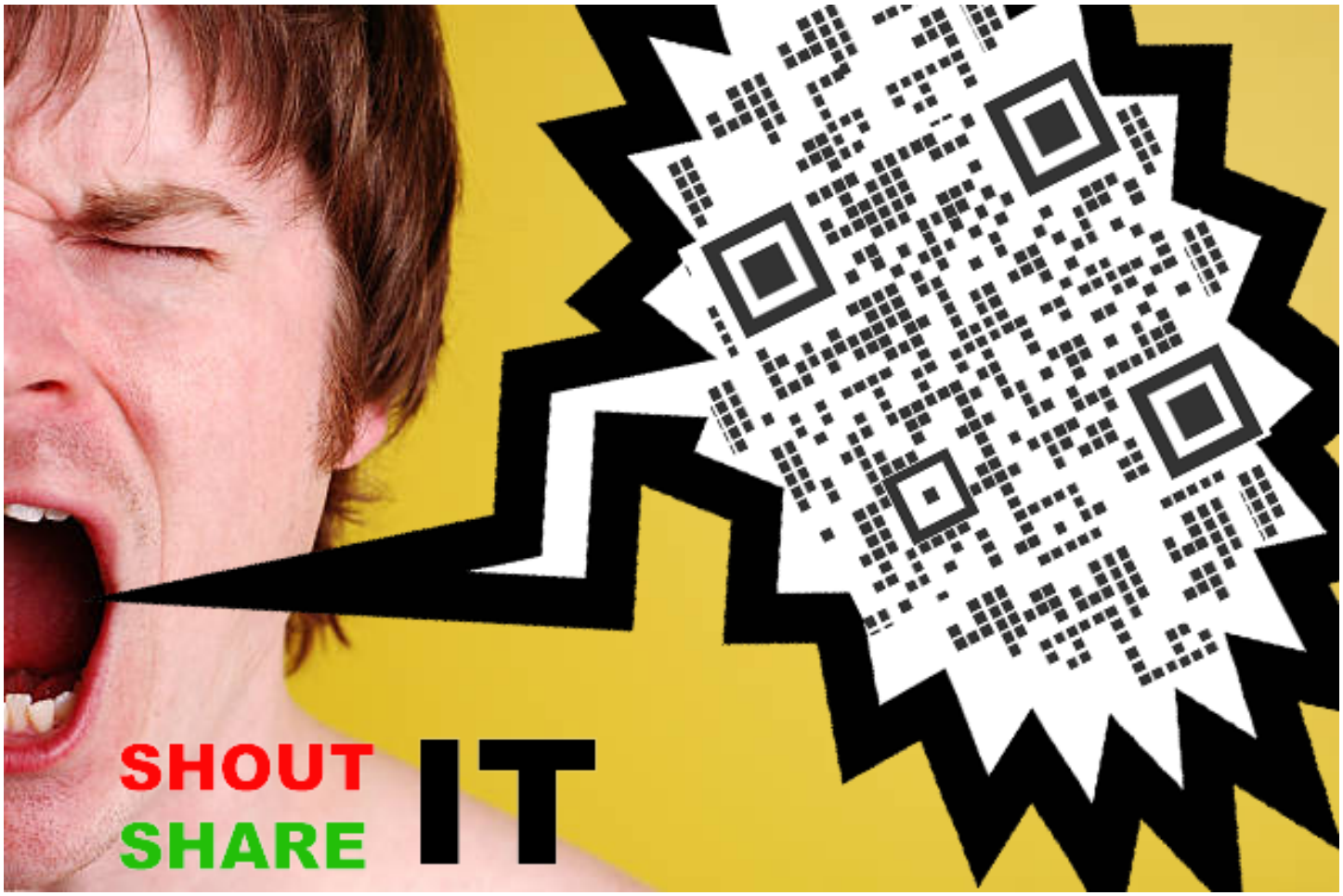
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# PROCEEDINGS

OF THE

# Biological Society of Washington

VOLUME XI

1897

WASHINGTON
PRINTED FOR THE SOCIETY
1897

## COMMITTEE ON PUBLICATIONS

C. HART MERRIAM, *Chairman*

T. S. PALMER

F. H. KNOWLTON

JUDD & DETWEILER, Printers

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OFFICERS AND COUNCIL

OF THE

# BIOLOGICAL SOCIETY OF WASHINGTON

**For 1897**

(ELECTED DECEMBER 19, 1896)

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## STANDING COMMITTEES—1897

*Committee on Communications*

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F. V. COVILLE — M. B. WAITE

*Committee on Publications*

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T. S. PALMER — F. H. KNOWLTON

*Delegate to the Joint Commission*

L. O. HOWARD

* Ex-Presidents of the Society.

VOL. XI, PP. VII-XII DECEMBER 30, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

## PROCEEDINGS.

The Society meets in the Assembly Hall of the Cosmos Club on alternate Saturdays at 8 p. m. Brief notices of the meetings, with abstracts of the papers, are published in *Science*.

### January 2, 1897—269th Meeting.

The President in the chair and 45 persons present.

F. A. Lucas exhibited skulls of the fur-seal showing deformities of the jaw-bones.

The following communications were presented:

E. W. Nelson: New Birds from Mexico.*

F. A. Lucas: On the Natural Mortality among Fur-seals.

### January 16, 1897—270th Meeting.

The President in the chair and 36 persons present.

Theo. Holm exhibited a copy of Fuchs' 'Histoire des Plantes,' published in 1549; also the first and last volumes of the 'Flora Danica.' He then exhibited a specimen of *Draba hyperborea*, calling attention to its monopodial development.

W. T. Swingle exhibited some algæ from the Bay of Naples, remarkable for the size of their special cells.

V. K. Chesnut showed specimens of *Cicuta vagans* and *Nerium oleander*, discussing their poisonous properties.

The following communications were presented:

David White: Unity or Plurality of Type Specimens in Palæontology.

*The Auk, XIV, pp. 42–76, Jan., 1897.

David White: A New Lycopodineous Cone from the Coal Measures of Missouri.*

Edward L. Greene: The Development of the Idea of a Genus.

M. A. Carleton: The Ontogenetic Separation of *Puccinia graminis arenæ* from *P. graminis tritici.*

**January 30, 1897—271st Meeting.**

The President in the chair and 45 persons present.

The following communications were presented:

C. Hart Merriam: The Pribilof Island Hair Seal.

C. H. Townsend: The Origin of the Alaskan Live Mammoth Story.†

Frank Benton: The Giant Bee of India.

L. O. Howard: Parasites of Shade Tree Insects in Washington.‡

**February 27, 1897—272d Meeting.**

The President in the chair and 28 persons present.

The following communications were presented:

C. H. Townsend: The Distribution and Migration of the Northern Fur-seal.§

Charles L. Pollard: What Constitutes a Type in Botany?

Lester F. Ward: Descriptions of Seven Species of *Cycadeoidea* from the Iron Ore Deposits of Maryland.‖

**March 13, 1897—273d Meeting.**

The President in the chair and 30 persons present.

The following communications were presented:

T. W. Vaughan and R. T. Hill: The Lower Cretaceous *Gryphæas* of the Texas Region.

Charles F. Dawson: The Dissemination of Infectious Diseases by Insects.¶

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*To be published in Monographs U. S. Geol. Survey.

†The Alaska Live Mammoth Story. <Forest and Stream, XLIX, pp. 124–125, Aug. 14, 1897.

‡A Study in Insect Parasites. <Bull. V, Technical Series, No. 5, Division of Entomology, U. S. Dept. of Agriculture.

§To be published in Report of the Bering Sea Commission for 1896.

‖Proc. Biol. Soc. Wash., XI, pp. 1–17, 1897.

¶To be published in Ann. Report for 1897, Bureau of Animal Industry, U. S. Dept. of Agriculture.

William Palmer: The Type (?) of a New Old Species.

Sylvester D. Judd: Sexual Dimorphism in Crustacea.

### March 27, 1897—274th Meeting.

The President in the chair and 30 persons present.

The following communications were presented:

M. B. Waite: Factors Governing Pear Blight.*

E. A. De Schweinitz: Some Methods of Generating Formaldehyde and its Use as a Disinfectant.†

Theo. Holm: The Grass Embryo and its Constituents.‡

### April 10, 1897—275th Meeting.

Ex-President W. H. Dall in the chair and 31 persons present.

The following communications were presented:

Theo. Gill and C. H. Townsend: Diagnosis of Deep-sea Fishes. (Read by title.) §

Jonathan Dwight, Jr.: A Species of Shearwater (*Puffinus assimilis* Gould) New to the North American Fauna.||

Sylvester D. Judd: Antennal Circulation in Crangonyx.

Charles T. Simpson: Notes on the Classification of Unios.¶

H. C. Oberholser: The American Golden Warblers.

T. Wayland Vaughan: Notes on a Monograph of the Eocene Corals of the United States.

### April 24, 1897—276th Meeting.

Ex-President W. H. Dall in the chair and 31 persons present.

Edward L. Greene exhibited and commented upon specimens of *Viola emarginata* and *V. heterophylla*.

The following communications were presented:

M. A. Carleton: Climate as an Element in Wheat Environment.

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*Substance in article entitled 'Cause and Prevention of Pear Blight.' <Yearbook U. S. Dept. Agric. for 1895, pp. 295–300, 1896.

†Journal of the American Public Health Association, October, 1896 (in part).

‡Am. Journ. Sci., iv, pp. 13–26, July, 1897.

§Proc. Biol. Soc. Wash., xi, pp. 231–234, September 17, 1897.

||Proc. Biol. Soc. Wash., xi, pp. 69–70, April 21, 1897.

¶Nautilus, xi, pp. 18–23, June, 1897.

Frederick V. Coville: Plant Food of the Wild Ducks in Chesapeake Bay.

Frederick V. Coville: The Water Hyacinth, *Piaropus crassipes*, as an Obstruction to Navigation in Florida.

L. H. Dewey: The Eastward Migration of Certain Weeds in America.*

**May 8, 1897 - 277th Meeting.**

The President in the chair and 56 persons present.

The following communication was presented:

C. Hart Merriam: Suggestions for a New Method of Weighing Species and Subspecies.†

By invitation, Hon. Theodore Roosevelt, Assistant Secretary of the Navy, presented an address on the same subject.

**May 22, 1897—278th Meeting.**

Ex-President Theodore Gill in the chair and 23 persons present.

David White exhibited eroded quartz pebbles found on the summit of a mountain, commenting on the probable cause.

The following communications were presented:

Erwin F. Smith: A Bacterial Disease of Cruciferous Plants ‡

B. T. Galloway: The Effects of Environment on Host and Parasite in Certain Diseases of Plants.

V. K. Chesnut: The Poison of the Common Black Nightshade.§

**October 9, 1897—279th Meeting.**

The President in the chair and 29 persons present.

L. O. Howard exhibited a specimen of *Belostoma colossicum* from Cuba, comparing it with the native *Benæus griseus*.

The following communications were presented:

R. T. Hill: Notes on Antillean Faunas, Past and Present.

B. W. Evermann: The Catfishes of Louisiana.‖

Theo. Gill: The Insufficiency of the Order Bunotherja.

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* Asa Gray Bulletin, v, pp. 31–34, June 11, 1897.

† Suggestions for a New Method of Discriminating between Species and Subspecies. < Science, n. s., v. pp. 753–758, May 14, 1897.

‡ *Pseudomonas campestris* (Pammel): the Cause of a Brown Rot in Cruciferous Plants. < Centralb. für Bakteriologie Abt. ii, Band 3. 1897.

§ To be published in a Farmer's Bulletin, U. S. Dept. of Agriculture, with descriptions of other poisonous plants.

‖ To be published in Bull. U. S. Fish Commission for 1898.

**October 23, 1897—280th Meeting.**

The President in the chair and 37 persons present.

The following communications were presented:

F. A. Lucas and C. W. Stiles: A Dangerous Parasite of the Fur-seal.

C. W. Stiles: The International Committee on Zoölogical Nomenclature.

M. B. Waite: A New Peach and Plum Disease.

F. V. Coville: The History and Distribution of *Abies shastensis*.*

By invitation, Prof. Mitsukuri, of the Imperial University, Tokyo, Japan, addressed the Society on the condition and progress of biological science in Japan.

**November 6, 1897—281st Meeting.**

The President in the chair and 39 persons present.

Lester F. Ward exhibited *Prosopis juliflora* from Kansas; also specimens of *Psoralea tenuiflora*, commenting on its tumbleweed propensities; and of *Lotus americanus*, a peculiar compass-plant.

E. L. Morris exhibited alcoholic specimens of vertebrates and invertebrates, showing methods of sectioning the alimentary canal.

The following communications were presented:

Charles L. Pollard: A Publication Problem in Botany.

M. G. Motter: Underground Zoology.†

F. A. Lucas: The Fossil Bison of North America.

C. Hart Merriam: Life Zones of the Olympic Mountains.

**November 20, 1897—282d Meeting.**

The President in the chair and 40 persons present.

David White exhibited various specimens of fossil carboniferous ferns.

Erwin F. Smith showed a new form of hypodermic injection syringe.

The following communications were presented:

O. F. Cook: A New Wingless Fly from Liberia.‡

V. K. Chesnut: Some Recent Cases of Mushroom Poisoning.

Erwin F. Smith: Bacterial Diseases of Plants.

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* To be published in Garden and Forest.

† To be published in the Journal of Experimental Medicine.

‡ To be published in Brandtia.

**December 4, 1897—283d Meeting.**

The President in the chair and 37 persons present.

Frederick V. Coville exhibited a globose mass of pine needles found on the shore of a lake in northern Idaho, commenting on the probable cause of its formation.

The following communications were presented:

L. J. Briggs: Causes of Water Movement in Soils.*

Sylvester D. Judd: Protective Adaptations of Insects from an Ornithological Point of View.

Theo. Gill: The Distinctive Characters of the Molinæ and Ranzaniinæ.

C. W. Stiles: The Honorary Ph. D.

**December 18, 1897—284th Meeting.**

(EIGHTEENTH ANNUAL MEETING.)

The President in the chair and 29 persons present.

The annual reports of the Recording Secretary and Treasurer for the year 1897 were presented, and officers for the year 1898 were elected as follows:

*President*—L. O. Howard.

*Vice-Presidents*—Richard Rathbun, C. D. Walcott, B. E. Fernow, F. V. Coville.

*Recording Secretary*—Charles L. Pollard.

*Corresponding Secretary*—F. A. Lucas.

*Treasurer*—F. H. Knowlton.

*Additional Members of the Council*—William H. Ashmead, Edward L. Greene, Ch. Wardell Stiles, F. W. True, M. B. Waite.

The following standing committees were appointed by the Chair:

*On Communications*—B. E. Fernow, chairman; F. V. Coville, M. B. Waite, E. A. De Schweinitz, W. H. Ashmead.

*On Publications*—C. Hart Merriam, chairman; T. S. Palmer, F. H. Knowlton.

* Substance embodied in a Bulletin of the Division of Soils, U. S. Department of Agriculture, now in preparation.

VOL. XI, PP. 1-17 MARCH 13, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTIONS OF THE SPECIES OF CYCADEOIDEA, OR FOSSIL CYCADEAN TRUNKS, THUS FAR DISCOVERED IN THE IRON ORE BELT, POTOMAC FORMATION, OF MARYLAND.*

BY LESTER F. WARD.

On November 4, 1893, I read a paper before this Society on 'Cycadean Trunks in the American Cretaceous,' which under the fuller title, 'Fossil Cycadean Trunks of North America, with a Revision of the Genus Cycadeoidea Buckland,' was published in the ninth volume of its Proceedings.† At that date only one species of cycadean trunks had been published from the Iron Ore beds of Maryland. This was founded on four specimens that had long lain in the Museum of the Maryland Academy of Sciences at Baltimore. They had been collected by Philip Tyson before the civil war, and he had mentioned them in his report as State Agricultural Chemist in 1860, recognizing their cycadean character and applying to them the term "Cycas," apparently without intending thereby to refer them to the living genus by that name, but merely to denote their resemblance to the trunks of plants familiar to all under that name. Much interest, I learn, was excited at the time by the discovery of these specimens, and the Maryland Academy of Sciences is said to have discussed their nature at a number of its meetings. Indeed, I have been

* Read before the Society February 27, 1897. Published by permission of the Director of the U. S. National Museum.

† Proc. Biol. Soc. Washington, vol. IX, Washington, 1894, pp. 75-88.

told that the subject came at last to monopolize its proceedings and that considerable asperity was ultimately created in the discussions, so much so that all at length became tired of the subject and it was allowed to drop completely out of their deliberations, never to be revived. At all events, it was nearly twenty-five years before any one's attention was again prominently called to these objects.

Mr. Tyson, however, had taken the trouble during the time that the question was uppermost to have photographs made of one of these specimens. He had also found much silicified wood in the Iron Ore beds, and he caused some large blocks of this to appear in the same view with the cycad trunk. Prints of this view were sent to many of the prominent paleontologists of this country and Europe. Among those receiving them was Dr. J. S. Newberry, and since his death his copy has been found at the Geological Museum of Columbia University and kindly placed in my hands by Dr. Arthur Hollick. In 1885 Mr. W J McGee, having learned that these specimens were still in the Museum of the Maryland Academy of Sciences, was permitted, through the kindness of the president of the Academy, Professor P. R. Uhler, to have a series of photographs taken of the two principal trunks. Copies of these photographs are also in my hands, and they were shortly after reproduced and published, forming plates clxxiv to clxxx of Professor Fontaine's Potomac or Younger Mesozoic Flora.* As stated in my former paper, Professor Fontaine described these trunks under the name *Tysonia Marylandica*, but as they do not belong to a genus distinct from those of Europe, Capellini and Solms-Laubach restored them to Buckland's genus Cycadeoida. The specimens are now in the Geological Museum of Johns Hopkins University.

Soon after the appearance of Professor Fontaine's work in 1890, Professor Uhler succeeded in obtaining a few additional fragments, but interest in the subject was not fairly aroused until about the year 1893, when Mr. Arthur Bibbins of the Woman's College of Baltimore began his remarkable series of discoveries which has resulted in bringing to light no less than fifty-nine specimens of these interesting objects. An account of his researches and results was published by me in 1894,† at which time

* Monographs of the U. S. Geol. Survey, vol. XV, Atlas.

† Recent Discoveries of Cycadean Trunks in the Potomac Formation of Maryland. Bull. Torr. Bot. Club, vol. XXI, No. 7, July 20, 1894, pp. 291–299.

he had already added thirty-five specimens to all that had been hitherto reported. Since that date he has continued actively to prosecute this work and has secured many more. Too great praise cannot be bestowed, either upon him for his successful method of work and his untiring zeal and industry, nor upon the Woman's College and its able president, Dr. John F. Goucher, for the liberal spirit shown, the keen scientific interest manifested, and the substantial aid rendered in advancing this work.

I also stated in the paper last referred to that through the generosity of President Goucher and all connected with that institution this entire collection had been loaned to the United States National Museum, and turned over to the Department of Fossil Plants for systematic elaboration, and the additional specimens, as fast as they were discovered, have also been regularly sent to Washington to join the rest. I had already commenced work on the important material of the same general nature from the Black Hills, an account of which was given in the paper presented to this Society of which I have spoken. It was decided to embody all the material in the Museum and all that could be secured from any American deposits in one general monograph of the Fossil Cycadean Trunks of North America, Dr. F. H. Knowlton to assume charge of all that pertained to the microscopic study of the internal structure and I to deal with the external and macroscopic aspects. I had hoped to have completed my part of the work before this, but many causes conspired to retard progress. Other pressing duties, both in the field and in the office, reduced the amount of time that it was possible to devote to it. The necessity for seeing the European specimens practically obliged me to spend a season on the other side of the Atlantic, the results of which had to be worked up and published.* The amount of labor involved was also very great, and the progress made is as satisfactory as could be expected under the circumstances. Much has been done on all classes of the material, but latterly I have been devoting myself chiefly to the Maryland specimens. It has been necessary to study anew all those obtained by Tyson, now in the Geological Museum of Johns Hopkins University, ample facilities for which have been generously extended to me by Professor W. B. Clark. Professor Uhler has also kindly allowed me to describe those in the Museum of the Maryland Academy of Sciences, and he sent

*See the Sixteenth Annual Report of the U. S. Geological Survey, pp. 463–542.

the two principal ones to Washington for the purpose. Artistic photographs have been taken of these and of all the more important trunks in Mr. Bibbins' collection.

A year ago I had proceeded far enough to have discovered that the cycadean trunks from the Iron Ore beds of Maryland embraced no less than seven good species which could be clearly separated and described, and since that time I have accomplished the work of describing and naming these species and of assigning each specimen to its appropriate specific group. As it is very convenient in the general discussion to be able to speak of these forms in a definite way, I have decided to publish these names with the descriptions, so that the new species may not need to be mentioned prior to such description, thereby cumbering the literature with *nomina nuda*. It is, however, clearly to be understood that these descriptions are not final, as they are based entirely on external characters and such macroscopic observations as I have been able to make of the internal parts prior, for the most part, to the cutting of sections, and do not embody any results that may be arrived at by Dr. Knowlton after a microscopic study of the various tissues. This latter, however, can scarcely result in reducing the number of species, as the more general characters are those that have been chiefly relied upon for specific differentiation, and if it results in increasing the number by showing that some of the specimens possess internal characters that cannot be specifically united with the others, this will lead to no confusion.

With regard to the classification adopted, I may remark that Buckland, in studying for the first time the fossil trunks from the Purbeck beds of the Portland quarries, called to his assistance the great contemporary botanist, Robert Brown, whom he expressly credits with the suggestion that the differences between the fossil and living forms are sufficient to establish a new family distinct from the existing family of Cycadeæ, and to which the name *Cycadeoideæ* was given. The generic name *Cycadeoidea* was also employed at the same time, but it afterwards transpired that this was not approved by Robert Brown, who only proposed the family name. Brown must therefore be credited with the name Cycadeoideæ and Buckland with Cycadeoidea. The wisdom of Brown's suggestion has been abundantly vindicated by the subsequent study of these forms, and the more their internal anatomy is made known, especially the nature of their inflorescence and

fructification, the clearer it becomes that all fossil cycadean vegetation from beds below the Tertiary represented a group distinct from the recent Cycadaceæ. When the nature of the reproductive apparatus was made known by Carruthers in the remarkable specimen which came from Luccomb Chine, on the Isle of Wight, he proposed for it a new generic name *Bennettites*, and Count Solms-Laubach established on the same data the family name *Bennettiteæ*. But it soon became obvious that the restricting of this name to this one form was simply based on our ignorance of the reproductive apparatus of other trunks, and wherever further data as to the latter have been brought forward they have strengthened the presumption that most or all fossil forms possessed a similar reproductive apparatus. Count Solms has therefore, in his latest important paper on the Bennettiteæ of the Italian museums, referred them all to Buckland's genus Cycadeoidea. In this, too, he incidentally includes many other European and some American forms, while adhering to the one species of Bennettites, *B. Gibsonianus*, in which the fruit is known, and as a result of an examination of photographs of our American forms he has stated in letters to me that certain of them are certainly to be referred to Bennettites. But in such studies as I have been able to make of these forms, whether from Maryland or from the Rocky Mountain region, I am unable to see anything that can be called a generic difference, and they all resemble the Italian forms more closely than they do those from Portland. I therefore, in the former paper, grouped them all as Cycadeoidea, and I have not since seen any reason for departing from this view. Until their internal structure is further studied I shall adhere to this name, and in view of all that has been said I am disposed to extend Robert Brown's group name to all the Mesozoic cycadean vegetation, whether represented by trunks or by foliage, fruit, or other organs, on the general assumption that however many genera there may have been, if they could be correlated the foliage, etc., would belong to the trunks found in the same general beds. In a matter of which so little is known, all is at best provisional, and a convenient and flexible nomenclature is the chief result to be aimed at.

The full classification of the Cycadaceæ would therefore be to use that term to represent the entire family, both living and fossil, and to subdivide it into the two subfamilies, the Cycadeæ for the living forms and the Cycadeoideæ for the fossil forms. This is the classification adopted below.

## Subkingdom SPERMATOPHYTA.

### Class GYMNOSPERMÆ.

### Family CYCADACEÆ Lindley.

### Subfamily CYCADEOIDEÆ Robert Brown.

Fossil cycadean vegetation of Mesozoic age represented by trunks, foliage, and fruits, and embracing a large number of genera and species, the trunks usually not accompanied by other organs than the bases of the leaf stalks, and reproductive axes included in a false bark or "armor" generally of considerable thickness; foliage usually also found separate from other parts, and fruits and rarely flowers similarly isolated. The number of genera and species is therefore necessarily duplicated and multiplied, owing to the impossibility of correlating the detached parts, but that those found at similar horizons and localities belonged together admits of no doubt. The trunks differ in size and form much as do living Cycadaceæ (Cycadeæ), and characters of all parts show resemblances to existing genera. It is, however, probably incorrect to say that the latter have descended from the former, or that the fossil forms are embryonic types of the living forms, and the correct conception of the subfamily is embodied in the law of sympodial development,* according to which the principal trunk line of descent which the fossil forms represent, and which attained its maximum development in Mesozoic time, became extinct, while inferior lines or branches represented by living forms persisted into modern times. This accounts for the fact so prominently insisted upon by Count Solms-Laubach and others that the fossil forms, at least those in which the reproductive organs are preserved embedded in the armor of the trunks (Bennettites), are structurally more advanced than the living Cycadaceæ, a fact which finds its counterpart in the Lepidophyta and Calamariæ of the Carboniferous and in the Dinosauria of the Mesozoic.

### Genus **Cycadeoidea** Buckland.

1827. *Cycadeoidea* Buckland, Proc. Geol. Soc. London, vol. I, No. 8, pp. 80–81 (session of June 6, 1827).

1828. *Cycadeoidea* Buckland, Trans. Geol. Soc. London, 2d ser., vol. II, pp. 375–401, pl. xlvi–xlix.

Fossil trunks of Cycadeoideæ, chiefly low (30–90 centimeters in height) and more or less conical or oval in shape (15–75 centimeters in diameter),

* Proc. Biol. Soc. Washington, vol. V, Washington, 1890, p. 24. Lester F. Ward: The Course of Biologic Evolution (reprint of above), p. 2.

usually simple, but sometimes branching, with a depression at the summit, in the middle of which, when not decayed, there is a terminal bud of conical shape; terminal bud, however, usually wanting in the fossils, leaving a cavity commonly known as the "crow's nest," by which name for this reason the specimens from the Portland quarries are popularly known. The armor consists of appendicular and reproductive organs surrounding and enveloping the axis, the former being the bases of the leaf stalks or petioles, which are surrounded by a dense mat of ramentum or fine hairs.

The leaf stalks are normally four-sided and four-angled, the lateral angles acute and nearly equal, the vertical angles obtuse but unequal, the lower much sharper than the upper, so as to render the cross section subrhombic. This form varies on the one hand to a true rhomb, and on the other hand to a true triangle, the most frequent intermediate type being that in which the upper angle is wanting, and the two upper sides are reduced to a simple curve or arch, so that the cross section assumes the form of a drawn bow and bowstring, the arch formed by the two upper sides representing the bow and the two lower sides, with their reëntrant angle, representing the bowstring. In size the leaf stalks vary from 15 to 35 millimeters in width measured between the lateral angles, and from 5 to 20 millimeters in height measured between the vertical angles, or from the lower angle to the summit of the arch formed by the two upper sides. The line joining the former is not generally horizontal or at right angles with the axis of the trunk, but one is usually slightly lower than the other. The line joining the latter is not generally vertical or parallel to the axis of the trunk, but one is usually a little on one side of the other. The only portion of the leaf bases that is always preserved in the fossil state is the mat of ramentaceous hairs that surrounds them. In the great majority of cases the petioles themselves are decayed to a greater or less distance below the summit of these mats, which thus constitute walls surrounding and enclosing the portion that remains of the petioles, if any, and in their absence forming definite cavities having the shape of the cross section of the leaf stalks, which constitute the leaf scars. These leaf scars, with or without the lower portion of the leaf bases, penetrate to the axis of the trunk and form a varying angle with it. Normally this angle is a right angle over all the central portions of the trunk, while below the organs are slightly descending and above more and more ascending to the apex, where they become vertical. At the summit, too, they diminish in size and usually in form, and are reduced in and immediately around the terminal bud to small triangular or polygonal bracts (*perulæ* of Miquel). In some species (*C. Uhleri*) all the organs of the body of the trunk are deflexed, and in one (*C. Goucheriana*) there is a definite zone near the middle of the trunk, below which they are descending and above which they are ascending. The leaf scars are arranged in a more or less exact quincunx order, and usually in two sets of spiral rows around the trunk, in one of which they ascend from the base in the direction from left to right and in the other from right to left, crossing each other at varying angles, and both rows making a certain angle with the axis of

the trunk, which varies with the species and more or less with different specimens of the same species. One of the two sets of rows is usually more distinct than the other, but the more distinct rows sometimes pass upward from left to right and sometimes from right to left. The bases of the petioles when present and well preserved often show at the surface presented to view a row of pits all round parallel to the walls and at different distances from the margin representing the vascular strands. Other such pits are sometimes present near the center. The petioles are frequently disarticulated at a natural joint, which may fall near or at the summit of the scar, or it may fall some distance within the scar. In some species there are two such joints separated by a node. Occasionally these joints consist of a thin membranous diaphragm stretching across the petiole, of firmer texture than the rest of its substance. Even where the petioles are wholly absent the position of the joints or diaphragms can sometimes be determined by a sharp ridge round the inside of the scar. The walls are made up of the ramentum of two adjacent petioles. In some cases these matted masses are so dense as to produce a simple homogeneous plate on all four of the sides, which, where the petioles are wanting, forms a deep, angled cavity of exactly the shape of a cross section of the petiole. Usually the portion of the wall furnished by each of the adjacent petioles can be distinguished by a junction line or commissure, visible along the outer edge of the wall. This commissure sometimes takes the form of an intermediate plate of a less dense consistency than the two outer plates. In other cases this central plate is much thicker than the two outer ones, which latter may be reduced to the appearance of thin linings of the scars. In still other cases the central portion is more or less open and cavitous. The walls vary from 1 millimeter or even less to 5 millimeters or, in rare cases, 8 millimeters in thickness.

The other class of organs that help to make up the armor are the reproductive organs. These are borne on all parts of the surface of the trunks except, perhaps, in immediate connection with the terminal bud, which is exclusively an organ of growth. They are scattered about with very little order over the surface among the leaf scars. They are usually of a harder substance than that of the foliar organs and better adapted to resist erosive influences to which the fossil trunks are exposed. Where the trunks are worn, therefore, the reproductive axes are liable to protrude somewhat. Viewed from without, they usually present an organ with an elliptical cross section, the longer diameter being nearly horizontal, variable in size, but always larger than the leaf scars. The central portion is often wanting, and a funnel-shaped cavity less deep than the leaf scars takes its place. When the central portions are present they show markings having the form which the outer ends of the essential organs present, which is very variable and usually obscure. Surrounding the central portions are several rows of open scars arranged concentrically. These scars are sometimes triangular, quadrangular, polygonal, or nearly circular; but the most of them, especially the outer ones, are somewhat crescent-shaped, having the concave side toward the center. The inflorescence is a spadix surrounded by an involucre consisting of the concen-

trically arranged bracts or scales whose scars were last described. The spadix has a receptacle at the base, located near the inner surface of the armor and supplied with fibers from the axis. From the receptacle there rise two kinds of organs, first, peduncles or filaments, known in a few specimens to bear seeds and conjectured in one specimen to bear anthers at their summits, and, second, elongated chaff-like scales more numerous than the latter and rising above them, the upper portions expanding and forming a dense mat or covering over the essential parts. In most cases all these organs are wholly included in the armor, the only seeds that have thus far been found being deeply embedded in the tissues. The organs of inflorescence are probably axillary, but owing to the proximity of the leaf scars this is not generally apparent. In regions of the surface where they occur they usually crowd the leaf scars and cause variations in their shape. This effect is most marked on the upper sides of the scars, often quite obscuring or obliterating their normal features.

The axis of the trunk inclosed in the armor when complete consists of four parts, which, enumerated from without inward, may be denominated respectively as (1) the libro-cambium, (2) the parenchymatous wood, sometimes called the cortical parenchyma, (3) the wood proper or fibrovascular zone, and (4) the medulla or pith. In many cases the libro-cambium zone cannot be definitely distinguished from the cortical parenchyma, and nothing is visible but the large and numerous vascular bundles passing out from the interior into the leaves; but sometimes there occurs a definite line or thin zone of loose tissue immediately below the bases of the leaf stalks. There is usually a zone of apparently homogeneous cellular tissue, often of considerable thickness, filling the interval between the armor and the woody axis. The woody zone consists of one or more rings of exogenous tissue traversed by medullary rays. Where more than one, they are separated by thin interstices of parenchymatous tissue. The medulla is usually large and composed of coarse parenchyma.

### Cycadeoidea Marylandica (Font.) Cap. and Solms.

1860. *Cycas* sp. Tyson, First Report State Agric. Chem. Maryland, p. 42.
1870. *Bennettites* sp. Carruthers, Trans. Linn. Soc. London, vol. XXVI, p. 708.
1879. *Cycadeoidea* sp. Fontaine, Am. Journ. Sci., 3d ser., vol. XVII, p. 157.
1889. *Tysonia Marylandica* Fontaine, Potomac or Younger Mesozoic Flora, Monogr. U. S. Geol. Survey, vol. XV, p. 193, pl. clxxiv–clxxx.
1892. *Cycadeoidea Marylandica* (Font.) Cap. and Solms, Mem. Real. Accad. Sci. Ist Bologna, ser. V, tom. II, pp. 179, 180, 186.

Trunks of medium or rather large size, almost always more or less laterally compressed so as to be elliptical in cross section, conical in shape or slightly narrowed near the base with a terminal bud set in a slight depression at the summit, simple, or in one specimen, apparently having one branch; mineral constitution very variable according to mode of preservation, but usually not hard, flinty, or heavy and compact; reddish, pinkish, drab, or ash colored; 25 to 45 centimeters high, 24 to 40 centi-

meters in longer and 12 to 26 centimeters in shorter diameter, with a girth of from 70 centimeters to one meter; organs constituting the armor proceeding at a right angle to the axis except above, where they are ascending, and near the base, where they are sometimes slightly descending; leaf scars arranged in two series of spiral rows crossing each other usually at a different angle to the axis of the trunk, the angle varying from 30° to 75°; scars usually subrhombic, *i. e.*, with the lateral angles nearly equal and the vertical ones unequal, the lower more acute than the upper, the latter often reduced to a mere groove or wanting entirely and the two upper sides together forming an arch, the whole scar simulating a drawn bow and bowstring, but sometimes triangular, the upper sides joined along a horizontal line, or more irregular in shape, occasionally with four curved sides and four acute angles; the width as represented by a line joining the two lateral angles varying from 15 to 25 millimeters, and the height as represented by a line joining the two vertical angles (which would rarely be parallel to the axis of the trunk) varying from 6 to 15 millimeters; remains of the petioles usually present in the scars at different distances from the summit, often bearing evidence of having been disarticulated at a natural joint, sometimes indicating the existence of two such joints at different depths in the scars, and showing that these joints consist of a diaphragm across the petiole which may remain after the substance of the petiole has partly decayed below it leaving a hollow space, portions of the outermost diaphragms also sometimes adhering to the sides of the scars in the form of a ridge surrounding them; vascular bundles rarely visible under an ordinary lens, but occasionally seen in the form of a row near the outer margin all round the leaf base with a few near the center; ramentum walls usually rather thick, but varying from less than 1 millimeter to 9 millimeters, ordinarily with a more or less distinct line marking the junction of the parts belonging to adjacent petioles (commissure), sometimes with a distinct plate or layer of less compact tissue between these, occasionally but rarely affected with pits or small bract scars especially in the angles; reproductive organs usually abundant, often solid and protruding, generally more or less distinctly marked in the center by the remains of the essential organs and surrounded by bract scars in several concentric rows, but often decayed in various degrees, leaving corresponding funnel-shaped cavities, commonly elliptical in cross-section, wider than high, very variable in size, the major axis 15 to 40 millimeters and the minor 10 to 30 millimeters; armor thin, 2 to 5 centimeters, usually joined to the internal parts by a clear line, but without measurable thickness, but sometimes very irregularly so joined and occasionally showing a thin libro-cambium layer; woody zone 3 to 10 centimeters thick, usually with two or three more or less distinct rings, the outer or parenchymatous zone thicker and firmer than the inner or fibrovascular zone; medulla usually homogeneous in structure, elliptical, the major axis 8 to 17 centimeters, the minor 3 to 9 centimeters.

Eighteen specimens are referred to this species. The type specimens are of course the originals of Tyson, of which the one photographed by

him should stand at the head. I shall refer to it as No. 1 of the specimens at the Johns Hopkins University, although Professor Fontaine calls it No. 2. It is the largest and most perfect of the trunks belonging to this species. The other nearly perfect trunk of the original lot, which Professor Fontaine calls No. 1, will be referred to as "Johns Hopkins Cycads No. 2." The other two specimens described by Professor Fontaine were fragments, and were called by him "fragment No. 1" and "fragment No. 2." The first of these belongs to another species, as will be seen below. His "fragment No. 2" probably belongs to this species, but is somewhat anomalous. It will be referred to as "Johns Hopkins Cycads No. 3." A few years ago Professor Clark informed me that another specimen had been found about the University buildings, but he could give no further account of it. With his permission I have examined and described it and have had photographs made not only of this, but also of the other two fragments, which had not hitherto been illustrated. The newly found specimen, although not an entire trunk, is much more complete than either of the other fragments. It clearly belongs to this species, and will be referred to as "Johns Hopkins Cycads No. 5." The largest specimen in the Museum of the Maryland Academy of Sciences also belongs to this species, although it has suffered much from wear and many of the characters are obscured. It will be referred to as "Maryland Academy Cycads No. 1." The remaining thirteen specimens belong to the Woman's College and embrace the following numbers of the museum of that college: 1192, 1428, 1481, 1486, 1656, 1657, 3050, 3051, 3056, 3057, 3324, 3328, 3341. Many of these are fine specimens, consisting of nearly complete trunks, and of the specific identity of such there is no doubt, but there are several small and imperfect fragments, which scarcely show characters enough to render their specific assignment safe. In these and all similar cases I reserve the right to alter the assignment in case further study or future discovery shall seem to require it. The most important of these specimens is No. 1481, because, besides being a nearly perfect trunk, showing all the typical characters, it is the only one of Mr. Bibbins' specimens whose exact stratigraphical position is definitely determined.

### Cycadeoidea Tysoniana n. sp.

Trunk medium sized or large, more or less compressed laterally; leaves slightly ascending; leaf scars arranged in spiral rows, 9 millimeters high, 22 millimeters wide, subrhombic, empty to some depth, petioles persistent at base, the vascular bundles arranged in one row near the exterior and a group near the center, often persisting after the decay of the remaining substance; ramentum walls thin, often with a layer of spongy substance in the middle, wrinkled on the edges; reproductive organs few and small: armor 5 centimeters thick; libro-cambium zone sometimes distinct, 3 millimeters thick; woody zone 6 to 8 centimeters thick, consisting of a broad outer parenchymatous layer 4 to 6 centimeters thick, and a narrow inner vascular zone 1 centimeter thick, the latter usually between open

tissue without and within, its inner wall strongly marked with longitudinal grooves; medulla distinct and homogeneous, light and porous.

This species is represented only by a single specimen, No. 1472 of the Woman's College. It approaches *C. Marylandica* in some respects, but differs in the larger leaf scars, thinner walls, thicker armor, and the great paucity of reproductive organs. It is to be regretted that Professor Fontaine did not name the original species with which Mr. Tyson's name will always be so intimately connected in his honor instead of the genus, which must fall before the laws of nomenclature. I have endeavored in the above name to supply the defect in some small degree.

### Cycadeoidea McGeeana n. sp.

Trunks low and flat, with ample diameter, sometimes three times as thick as high, yellowish, brown, or nearly black, more or less porous and spongy, and of low specific gravity; leaves and spadices set nearly at right angles to the axis; leaf scars arranged somewhat definitely in quincunx order and disposed in spiral rows around the trunk, small and uniform in shape, subrhombic with the vertical angles obtuse, the lateral ones acute, narrow-elongate, 6 to 10 millimeters in vertical by 16 to 20 millimeters in lateral dimensions, averaging 8 by 20 millimeters, usually empty by the disappearance of the leaf bases, at least to a considerable depth; ramentum walls thin, often less than one millimeter, with or without evident commissure, and with occasional punctations; axes of inflorescence few and scattering, sometimes projecting and filled with the substance of the spadix, sometimes cavitous from the decay of the essential organs, surrounded by obtusely triangular or somewhat crescent-shaped bract scars; armor 4 to 5 centimeters thick; liber and cambium sometimes distinguishable; woody zone usually divided into two or three rings; medulla large, porous.

A very distinct species of low and squat trunks, some of them having almost the form of a car wheel, only a very small part of which can be due to vertical compression. The external organs, however, closely resemble those of *C. Tysoniana*. It embraces seven specimens, all belonging to the Woman's College, as follows: Nos. 1471, 1659 and 1659*a*, which belong together, 3055, 3068, 3323, 3325, and 3349. The most complete specimen is No. 1471, which is taken as the type and which has been cut through vertically and the surfaces polished. The specimen consisting of the two complementary fragments 1659 and 1659*a* is also very interesting, though representing only about two-thirds of the whole trunk. The other specimens are all fragments.

I have named the species for Mr. W J McGee, by whom the Potomac formation was named and whose extensive studies in that formation are well known. As stated above, it was largely through his efforts that interest in the cycads of the formation was revived, and he it was who caused the photographs to be taken that were used to illustrate Professor Fontaine's monograph of the flora.

**Cycadeoidea Fontaineana** n. sp.

Trunks small and low, usually much compressed or flattened vertically, light brown to whitish in color, often spongy or porous and of low specific gravity; leaves and spadices set nearly at right angles to the axis; leaf scars not obviously arranged in spiral rows or imperfectly so arranged, variable and irregular in shape, usually with four angles and four curved sides, often in the form of a cross, rarely subrhombic, small, 8 to 12 millimeters in vertical and 14 to 25 millimeters in lateral measurement, averaging 10 by 19 millimeters; ramentum walls thick, 4 to 10 millimeters, usually without commissure or punctations; leaf bases rarely present, when so, spongy or porous without visible bundles; terminal bud (present in one specimen) 6 centimeters high, 65 millimeters broad at the downwardly convex base, definitely bounded below, symmetrically conical above, consisting of a mass of densely matted bracts imbricated along a central axis; reproductive organs few and imperfectly defined, usually cavitous in the center and sometimes surrounded by irregular-shaped bract scars; armor rather thin, 2 to 4 centimeters; liber and cambium obscure; woody axis divided into several rings, sometimes consisting of a loose, open structure separated by thin, firm plates, the inner face next the medulla definitely marked by the remains of vessels and medullary rays; medulla large, marked on the external surface by thin longitudinal ridges or lamellæ varying from 1 to 3 centimeters in length, the ends overlapping adjacent ones (*Cycadeomyelon* Saporta), internal parts coarse and porous or somewhat chambered.

This species resembles *C. McGeeana* in the general form of the trunks, but the external organs are very different. It embraces fifteen specimens, all but two of which belong to Mr. Bibbins' collection. The two smaller specimens in Museum of the Maryland Academy of Sciences have been somewhat doubtfully referred to this species. They are fragments, and show so few characters that their specific relations are obscure. The other specimens bear the following numbers of the Museum of the Woman's College of Baltimore: 1467, 1470, 1473, 1485, 1488, 1658, 3046, 3122, 3326, 3327, 3346, 3347, 3350. No. 1467 has been taken as the type of the species, although it does not show quite all the characters. It has the most perfect terminal bud in the entire collection, and a vertical section of the specimen has been made which passes through the center of the bud. There are two other specimens of special interest; one of these is No. 1470, which consists of a fine piece of the medulla, with its characteristic external markings (*Cycadeomyelon* of Saporta), to which is attached a portion of the armor and connecting tissues in such a manner as to show their relations. The other is No. 3046, called the "chicken trough" because so used by its owner at the time of its discovery. The large decayed cavity at the summit affords an excellent view of the structure of the internal parts. The remaining specimens are fragments of greater or less completeness.

In naming this species I have wished to commemorate the pioneer investigator of the deposits from which the cycads are derived and to whom

science is indebted for the greater part of all that is known of the flora of these deposits.

### Cycadeoidea Goucheriana n. sp.

Trunk large, cylindrico-conical with elliptical cross section, 30 to 50 centimeters high, 25 to 50 centimeters in diameter, light colored and of low specific gravity, somewhat chalky and friable; lower leaves somewhat deflexed, upper ones ascending, the line between the two definite and encircling the trunk near the middle; leaf scars arranged in two sets of spiral rows, both having nearly the same angle to the axis, 45° or greater; scars variable in size and shape, chiefly subrhombic to nearly triangular with curved or fluted sides, inner wall of the tubes marked by a raised line around it; scars averaging 11 millimeters in vertical and 23 millimeters in lateral measurement; leaf bases usually absent or only adhering to the bottom of the scars; ramentum walls thick, more or less divided into irregular laminæ or scales with fissures between them, their outer edges ragged; reproductive organs numerous, well marked, irregularly scattered over the surface, most abundant at the narrower sides, usually cavitous in the center, sometimes solid and protruding, surrounded by concentrically arranged crescent-shaped bract scars, sometimes well exposed and clearly distinguishable into spadix and involucre, the scales of the latter imbricated, the entire organ conical with the apex toward the axis of the trunk: armor 3 to 5 centimeters thick, separated from the wood by a definite line; woody zone 4 centimeters thick, consisting of an outer parenchymatous ring 3 centimeters thick, a thin ring of loose open structure, and two thin plates separated by another ring of coarse cells divided by radial partitions, the inner walls of both plates marked with the scars of the medullary rays, the pattern different in the two cases, the scars on the inner plate 13 millimeters long, those on the outer longer and tapering upward; medulla large, elliptical, tapering upward, of a coarse, homogeneous structure.

Only one specimen referable to this species has thus far been brought to light, but this is one of the most perfect and also one of the most beautiful of all that have been discovered in the Iron Ore beds. It is further of special interest from the circumstance that its exact stratigraphical and local position when found is so thoroughly vouched for that there is little room for doubt in the matter. It is with great pleasure that I name it in honor of Dr. John F. Goucher, president of the Woman's College of Baltimore, to whose liberal and munificent policy the entire collection is due.

### Cycadeoidea Uhleri n. sp.

Trunks small, 28 centimeters high, 20 centimeters in diameter, 50 to 60 centimeters in girth at the thickest part, circular, or only slightly elliptical in cross section, conical or somewhat cylindrical-conical in shape, contracted at the base, silicified, but porous and light, reddish or gray in color; leaf scars definitely arranged in quincunx order and spiral rows

around the trunk, one of these sets of rows ascending at an angle of 45° to the axis, the other at a much greater angle; subtriangular, the upper side arched and sometimes slightly grooved, lateral angles acute, inferior angle obtuse or rounded; scars uniform in size, 18 millimeters wide and 9 millimeters high; ramentum walls 4 to 5 millimeters thick, commissure distinct, the whole punctured with minute rhombic, triangular, or elliptical bract scars, deeply penetrating the structures; leaf bases usually wanting, but sometimes nearly filling the cavities; vascular bundles few, arranged in a row near the upper side of the petiole and others scattered over other parts; petioles all reflexed or pointing downward at a strong angle; reproductive organs numerous, situated directly over the leaf scars, *i. e.*, axillary, ellipical in outline, 15 millimeters wide, 10 millimeters high, the center occupied by the remains of the essential organs or by a circular cavity where these have disappeared; bract scars small and numerous, somewhat curved and arranged concentrically around the spadix, also passing out into the ramentum walls; armor 3 to 5 centimeters thick; woody zone 15 to 35 millimeters thick, divided into two or three rings; medulla about 5 centimeters in diameter, cylindrical or elliptical according to the shape of the trunk, heterogeneous in composition, being traversed by dike-like plates of a hard substance dividing it into chambers, often wanting, leaving a hollow center to the trunk.

Only two specimens are referable to this species, both of which agree almost exactly and show the distinct specific characters which so clearly separate it from all the others. The most perfect of these specimens was kindly sent me by Professor Uhler for comparison with the one in Mr. Bibbins' collection, which bears the number 1429 of the Museum of the Woman's College. This latter is a fragment freshly broken from a larger piece, which has not yet been recovered, although considerable is known of its history. It must have been taller than the perfect trunk and perhaps more cylindrical in shape. The other and almost complete conical trunk also has a history which I have not as yet sufficient data to record, but this much seems clear, that both these specimens were originally found at nearly the same spot.

No one has taken greater interest in the fossil cycads of Maryland than Professor P. R. Uhler, so long president of the Maryland Academy of Sciences and now Provost of the Peabody Institute of Baltimore, and it is fitting that this species should bear his name.

### Cycadeoidea Bibbinsi n. sp.

Trunks large, 40 to 60 centimeters high, laterally compressed, girth of largest specimen 1 meter, of next in size 88 centimeters, shorter axis of cross section one half to two thirds of longer axis, contracted toward the summit, terminating in a conical bud 30 centimeters high, or, where this is wanting, in a concave depression, thoroughly silicified throughout, heavy and solid, of a dark color; all the organs of the armor nearly at right angles to the axis of the trunk; leaf scars arranged spirally around the trunk in imperfect quincuncial order, subrhombic,

the lower angle much sharper than the upper, the latter sometimes reduced to a curve, 14 millimeters high, 26 millimeters wide; ramentum walls moderately thick, usually solid; vascular bundles of the petioles arranged in a row entirely around them and near the margin of a cross section, also sometimes a few near the center; spadices abundant, irregularly scattered over all parts of the surface, usually showing the marks left by the essential floral organs or a central cavity occupying their place, surrounded by curved or crescent-shaped pits concentrically arranged in several rows and set concave to the axis of the spadix, representing the involucral bracts; armor varying from 25 to 75 millimeters in thickness, this variation often great in different parts of the same specimen; cambium layer indistinct; liber zone not generally distinguishable from the wood; the latter in two or three zones, medullary rays faint; medulla well marked, homogeneous, usually spongy in appearance.

This species represents a type quite distinct from all the others, and the cycadean trunks of the Iron Ore deposits of Maryland might be divided into two classes, one of which should embrace all the forms included in the six species above described and the other those that have been referred to this species. The fact that the rock in the latter is always firm, hard, and heavy and usually dark colored is not merely an accident of preservation, but results in some obscure way from the nature of the vegetable tissues. The trunks are generally larger and the leaf scars much larger, though they have nearly the same form and arrangement. The reproductive organs are more abundant and usually very regular and definite in their character.

Eighteen specimens belong to this group, all but one of which are of Mr. Bibbins' collecting. The one exception is the fragment in the Museum of Johns Hopkins University that Professor Fontaine described as "Fragment No. 1," which I call No. 4. The most typical specimen is the great "Polly Jones Trunk," No. 1427 of the Museum of the Woman's College of Baltimore. The other sixteen in their numerical order are as follows: 1426, 1462, 1463, 1464, 1465, 1466, 1468, 1478, 1480, 1482, 1483, 1484, 1487, 3047, 3054, 3348. Of these, Nos. 1462, 1463, 1465, 1468, and 1482 are large, nearly perfect trunks, and Nos. 1463, 1468, and 1482 have the terminal bud preserved. The rest are fragments, but many of them are quite full and show important characters on the fractured surfaces that do not appear in the more complete specimens. No. 1483 has been cut through and the surfaces polished, and admirably shows the internal arrangements of the leaves, fruiting organs, and vascular strands supplying them. Nos. 1484 and 3054 give the maximum development of the leading characters, especially those of the fruiting organs.

In many respects this species represents the most important and interesting group of Maryland cycads, nearly all the specimens of which, as we have seen, having been secured by Mr. Bibbins, and I have therefore sought in causing the species to bear his name to make that name forever inseparable from the class of objects which he has done more than all others combined to bring out of their hiding places into the light of scientific investigation.

The above arrangement of the seven species of Cycadeoidea from the Iron Ore beds of Maryland is intended to be that of their affinities, as indicated by the characters described, taking the original *C. Marylandica* as the point of departure and concluding with the *C. Bibbinsi*, which exhibits the widest divergence from that norm. *C. Tysoniana*, *C. McGeeana*, and *C. Fontaineana* represent a somewhat gradual transition. *C. Goucheriana* and *C. Uhleri* represent abrupt divergences in different directions, while *C. Bibbinsi*, as already stated, constitutes a distinct group.

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PROCEEDINGS

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# REVISION OF THE COYOTES OR PRAIRIE WOLVES, WITH DESCRIPTIONS OF NEW FORMS.

BY C. HART MERRIAM.

It has been customary to regard the Coyote as a single species, inhabiting western North America from the plains of the Saskatchewan to the southern end of the tableland of Mexico, and from the fertile prairies of the Mississippi Valley to the Pacific coast. A somewhat hasty study of the material now in hand, however, shows that the name Coyote has not been applied to a single animal, but to an assemblage of species comprising three well marked subordinate groups and a considerable number of distinct geographic forms. The results of this and similar studies should serve as a word of caution to those who are in the habit of citing the wolves, cats, weasels, and other groups as 'species' whose ranges violate the laws of geographic distribution.

It is often assumed that wolves and other large animals have no fixed home, but roam at will over enormous areas, the mothers stopping to give birth to and care for their young wherever chance finds them at the time. Except in the case of certain gregarious Ungulates, as the Buffalo, this belief is opposed to the laws of geographic distribution and the known facts respecting the breeding habits and 'home instincts' of animals. It is of course true that wolves which hunt in packs and follow moving herds travel relatively great distances, and that in winter they perform regular migrations and also roam irregularly over large tracts of country in search of food; but even these movements have geographic limitations, as proved by the constancy with which particular geographic forms are found within par-

ticular areas. Thus the snow-white Arctic Wolf never reaches the northern border of the United States, no matter how severe the winter, and the Red Wolf of Texas is unknown on our northern plains. In the case of the Coyote the present study goes far to show that except in winter, when migratory movements take place, the distances traveled by individual wolves are not sufficient to prevent the various species and subspecies from conforming to the faunal zones. It must be expected, however, that the belts of overlapping between the several zones will be broader in the case of such wide ranging animals as wolves than in the case of those whose means of locomotion are more limited.

The three groups of Coyotes have distinctive geographic ranges which conform to the well known life zones. Beginning at the north, they may be known as (1) the *latrans* group, inhabiting the Upper Sonoran and Transition zones and the southern edge of the Boreal; (2) the *frustror* group, inhabiting the Lower Sonoran of Texas (and probably Oklahoma and Indian Territory), the tableland of Mexico (at least its southern part), and the peninsula of Lower California, and (3) the *microdon* group, inhabiting the Arid Tropical belts of both coasts of Mexico and the lower Rio Grande region of Texas, and also the Lower Sonoran deserts of Arizona, Nevada, Utah, and California. *Canis latrans* is the largest of the Coyotes and has the largest teeth; *C. frustror* and its allies are of medium or rather large size and have somewhat smaller teeth; *C. microdon* and its relatives are smaller and have very much smaller teeth.

The eleven forms here recognized, with their type localities, are as follows:

1. Latrans group.
   - *Canis latrans* Say. Council Bluffs, Iowa.
   - *pallidus* nob. Johnstown, Nebraska.
   - *lestes* nob. Toyabe Range, Nevada.

2. Frustror group.
   - *Canis cagottis* H. Smith. Rio Frio, near city of Mexico.
   - *frustror* Woodhouse. Fort Gibson, Indian Territory.
   - *peninsulæ* nob. Cape St. Lucas, Lower California.

3. Microdon group.
   - *Canis microdon* nob. Mier, Tamaulipas, Mexico.
   - *mearnsi* nob. Quitobaquita, Pima County, Arizona.
   - *estor* nob. San Juan River, Utah.
   - *ochropus* Esch. 'California' (San Joaquin Valley).
   - *vigilis* nob. Manzanillo, Colima, Mexico.

## Geographic Distribution and Interrelations.

The material available for the present study is insufficient to admit of mapping the boundaries of the areas inhabited by the several forms, of describing the seasonal differences in pelage, or of determining which members of each group do and which do not intergrade; hence all are here treated as species. This much, however, may be said with considerable confidence: *Canis latrans* inhabits the humid prairies and bordering woodlands of the northern Mississippi Valley in Iowa and Minnesota, and follows the northern edge of the plains westward to the base of the Rocky Mountains in the province of Alberta. On the adjacent arid plains from eastern Colorado to Montana and Assiniboia it is replaced by and probably intergrades with the very pale *C. pallidus*. In cranial characters *C. pallidus* is closely related to the form inhabiting the plains of the Columbia in eastern Oregon and Washington, which appears to grade insensibly into *C. lestes*, the Coyote of the Transition zone from the dry interior of southern British Columbia, Washington, and Oregon southward over the higher lands of the Great Basin, the Sierra Nevada, and the Rocky Mountains to the plateau of northern Arizona, and thence along the continental divide to the Mexican boundary. It is not improbable, therefore, that the three members of the *latrans* group intergrade, though no skins showing intergradation have been seen.

The three members of the *frustror* group, on the other hand, are probably specifically as well as geographically distinct. Still, the limits of their ranges are unknown. *Canis frustror* inhabits the Gulf region of Texas from Nueces Bay northward and will probably be found throughout the Lower Sonoran area of Texas, Oklahoma, and Indian Territory. Its distant relative, *C. cagottis*, is known from only the southern part of the tableland of Mexico, but probably ranges northward along the west side of the tableland. The third member of the series, *C. peninsulæ*, is supposed to be restricted to the peninsula of Lower California.

The *microdon* group contains five very different forms. Of these, *C. microdon* inhabits the arid tropical or 'Tamaulipan' fauna of northeastern Mexico and the Lower Rio Grande region in Texas; *C. rigilis* the arid tropical coast region of Colima in western Mexico; *C. mearnsi* the Lower Sonoran areas of northern Sonora and southern Arizona; *C. estor* the adjacent Lower

Sonoran deserts of eastern California, Nevada, and Utah, and *C. ochropus* the Lower Sonoran San Joaquin Valley of California. Apparently the only forms in this series which can possibly intergrade are *C. mearnsi* and the pallid *C. estor*.

It should be observed that two of the groups—the *latrans* and the *microdon*—have each a pallid representative, and that these representatives (*pallidus* and *estor*) resemble one another externally so closely that they are hardly distinguishable except by size, while a glance at their teeth shows that they belong to opposite extremes of the whole series. It is not impossible that the third (or *frustror*) group also has a pallid member, but no specimens from the southern plains have come to hand.

Good skins with skulls are much needed from all parts of Mexico, Texas, Indian Territory, Oklahoma, New Mexico, southern Colorado, western Arizona, the Painted Desert in eastern Arizona, the coast ranges of southern California, eastern North Dakota, Manitoba, and the northwest coast region. The pelage is in best condition in early winter immediately after the fall molt, usually in December and January.

## History and Nomenclature.

Fortunately the Coyotes have escaped the complicated history and involved synonymy with which most groups are encumbered. This is due in the main to the widespread belief that all of the small wolves of North America belong to a single species.

So far as I have been able to ascertain, only four names have been proposed for the Coyotes. These are *Canis latrans* Say, 1823, for the Upper Mississippi Valley animal; *Canis ochropus* Eschscholtz, 1829, for the species from the interior of California; *Canis frustror* Woodhouse, 1851, for the Indian Territory (and Texas) animal; and *Lyciscus cagottis* Hamilton Smith, 1839, for the one from the southern end of the tableland of Mexico. All of these names are here recognized as designating valid forms.

## General Characters.

The pattern of coloration is the same in all the Coyotes. Except in the pale desert forms (*pallidus* and *estor*), in which the fulvous tints are replaced by buff, the muzzle, backs of the ears, outer side (sometimes the whole) of the fore and hind feet and

legs, and distal half of the under side of the tail are some shade of fulvous. The ground color of the back also varies from buff, or even buffy-white in the desert forms, to dull fulvous in the animal from southern Mexico, and the abundance of black-tipped hairs is usually proportionate to the intensity of the ground color. The upper side of the tail is like the back, and about one-third the distance from root to tip it is marked by an elongated black spot. The tip is always black, although it sometimes contains a tuft of white hairs, most often present in *C. ochropus*. The males are decidedly larger than the females.

Compared with the large Wolves, the Coyotes are slender, lithe, and graceful.* They are swift of foot, and in ordinary seasons feed chiefly on rabbits, both jackrabbits and cottontails, but they also catch ground squirrels and other small mammals, snakes, lizards, birds, and insects, and when put to it by hunger do not hesitate to eat carrion. They are also fond of fruit.

Unless the contrary is stated, all of the measurements in the present paper were taken 'in the flesh' by the collector. All are in millimeters.

## Descriptions of Species.

### Canis latrans Say.

*Canis latrans* Say, Long's Expedition to Rocky Mountains, I, 168, 1823.

*Type locality.*—Council Bluffs, Iowa.

*Characters.*—Size largest of the Coyotes; coloration rather pale; premolar and carnassial teeth very large and greatly swollen.

*Color.*—Muzzle dull and rather pale fulvous, finely sprinkled with gray hairs (chiefly above) and with black hairs (chiefly on cheeks); top of head from front of eyes to ears grizzled gray, the pale fulvous zone of under fur showing through, but the gray predominating; ears deep rich fulvous, sparingly sprinkled with black hairs; upper parts from ears to tail coarsely mixed buffy gray and black; under parts and upper lip whitish; long hairs of throat sparingly tipped with blackish, giving the broad collar a grizzled appearance; fore legs and feet dirty whitish, becoming dull clay color on outer side of leg; hind legs and feet dull fulvous on outer side, white on inner side and on dorsal surface of feet, the change from fulvous to white rather abrupt; tail narrowly tipped with black; its under side whitish basally, becoming pale fulvous on distal half and tipped and edged with black.

* It is hoped that no one will be misled, either as to the form or coloring of the Coyotes, by the gross caricature bearing their name in Mivart's recent 'Monograph of the Canidæ.'

*Cranial and dental characters.*—Skull* and teeth, particularly the latter, largest of the group; frontals flatter than in the other forms; premolars very much swollen, particularly the lower ones; carnassial teeth very thick and tumid. The only Coyotes whose skulls approach *C. latrans* in size are *pallidus, lestes, frustror,* and *ochropus.* The two latter may be dismissed at once on account of the great disparity in the teeth, the carnassials and premolars being hardly more than two-thirds as large as those of *latrans. C. frustror* differs further in having the frontals more elevated than in any other member of the group, while in *C. latrans* they are the flattest and most depressed. Large male skulls of *C. ochropus* sometimes have the rostrum (measured from back of last molar to front of incisors) of the same length as small males of *latrans,* but the rostrum is always very much narrower and the postpalatal part of the skull smaller. The difference between *latrans* and *ochropus* in size of teeth is very great, the upper carnassial and first molar together measuring 35 millimeters in an adult male *latrans,* contrasted with 30 in an adult male *ochropus* having the entire tooth row of exactly the same length. In *C. latrans* the premolars are so large that the tooth row is crowded, while in *ochropus* they are widely spaced. The teeth of the female *latrans* are decidedly larger than those of the male *ochropus.*

The species having teeth sufficiently large to require comparison with *latrans* are *pallidus* and *lestes.* In both of these the lateral teeth of the male equal or exceed those of the female *latrans.* Comparing skulls of the same sex, the upper carnassial and first molar and the premolars in both jaws, particularly the lower, are larger, more swollen, and more crowded in *latrans.* In *latrans* also the inner cusp (*protocone*) of the upper carnassial averages decidedly larger than in either of the others.

*Measurements.*—Female young adult from Elk River, Minnesota: total length, 1219; tail vertebræ, 394; hind foot (in dry skin), 179.

*Cranial measurements.*—♂ adult from Elk River, Minnesota: basal length, 190; basilar length of Hensel, 186; zygomatic breadth, 109; palatal length, 96; mastoid breadth, 65; length of crown of upper carnassial tooth, 22. The skull of an adult female from Elk River measures: basal length, 175; basilar length of Hensel, 172; zygomatic breadth, 100; palatal length, 96; mastoid breadth, 62; length of crown of upper carnassial tooth, 20.5.

### Canis pallidus sp. nov.

*Type locality.*—Johnstown, Brown County, Nebraska. Type No. 77093, ♂ young adult, U. S. National Museum, Department of Agriculture collection. Collected March 12, 1896, by E. E. Fast.

*Characters.*—Similar to *C. latrans,* but everywhere paler; backs of ears buff instead of fulvous; skull and teeth smaller.

*Color.*—Muzzle dull ochraceous buff; top of head grizzled grayish faintly tinged with buff; ears buff; upper parts pale buffy whitish or soiled white

*The skulls of *C. latrans* used in the present comparison are from Elk River, Minnesota.

sparingly mixed with black hairs, especially along middle of back; under parts white; no distinct collar (long hairs of throat not noticeably tipped with black); fore and hind legs and feet soiled white with faint buffy suffusion on outer side of fore legs, and tinged with palest fulvous on outer side of hind legs; tail pale, under side white basally, becoming buff, and narrowly tipped with black.

*Cranial and dental characters.*—Skull and teeth similar to those of *C. latrans*, but slightly smaller. The lower premolars and carnassial and the upper carnassial and first molar are decidedly smaller and less swollen than in *latrans*.

*Remarks.*—*C. pallidus* is a pale arid-land representative of *latrans*. It inhabits the Great Plains from eastern Colorado northward into Canada, and is common throughout Montana except in the mountains. On the southern plains, from eastern Colorado southward, it is replaced by another species. Specimens of both have been obtained at Arkins, Colorado.

*Measurements.*—Unfortunately we have no flesh measurements of the type specimen, but the hind foot (dry) measures 77 millimeters. The form averages a little smaller than *C. latrans*.

*Cranial measurements.*—(♂ adult, Johnstown, Nebraska.) Basal length, 177; basilar length of Hensel, 173; zygomatic breadth, 100; palatal length, 93; mastoid breadth, 63.5; length of crown of upper carnassial tooth, 21.

### Canis lestes sp. nov.

*Type locality.*—Toyabe Mountains near Cloverdale, Nevada. No. $\frac{245522}{32347}$, ♂ adult, U. S. National Museum, Department of Agriculture collection. Collected November 21, 1890, by Vernon Bailey. Original No. 2223.

*Geographic distribution.*—Transition and Upper Sonoran areas from the Rocky Mountains westward, and from the arid interior of British Columbia (Aschroft, Shuswap) southward over Washington and Oregon, and the mountains farther south to the plateau region of northern Arizona and New Mexico, and thence southward along the continental divide to the Mexican boundary. In California *C. lestes* inhabits the coast ranges about San Luis Obispo and probably elsewhere, as well as the Sierra Nevada, and in winter it wanders out over the deserts, invading the range of *C. estor*.

*Characters.*—Size large (next to *latrans*); ears and tail large; coloration almost as in *latrans;* cranial characters as in *pallidus*, but skull and teeth averaging somewhat larger.

*Color.*—Muzzle very pale cinnamon rufous; top of head from a little in front of eyes to ears grizzled gray and ochraceous; crown, nape, and ears fulvous, deepest on ears; rest of upper parts grayish buffy mixed with black hairs (general effect slightly paler than in *latrans*); underparts whitish, more or less suffused with buffy across middle of belly; long hairs of throat conspicuously tipped with black, forming a broad 'ruff'; fore and hind legs and feet buffy-ochraceous on outer side, whitish on inner side and on upper surface of hind feet; tail broadly tipped with

black; its lower surface whitish on basal third; ochraceous on distal two-thirds, the hairs of terminal third moderately tipped with black, the black increasing toward black end of tail.

*Cranial and dental characters.*—Skull and teeth clearly of the *pallidus* type; premolar and carnassial teeth smaller and less swollen than in *latrans*. Compared with *C. ochropus*, the skull and teeth are larger and more massive and the rostrum is much broader. A much closer resemblance exists between *C. lestes* and the broad-muzzled *peninsulæ* and *frustror*. Contrasted with *peninsulæ*, the skull is somewhat larger and the teeth heavier; contrasted with *frustror*, the skull is smaller (decidedly shorter), more massive, the frontals flatter and less elevated posteriorly, and the teeth very much larger.

*Remarks.*—Externally *Canis lestes* resembles *C. latrans*, being much more highly colored than its nearest relative, *C. pallidus*. On the other hand, it is decidedly paler than either *peninsulæ* or *frustror*. Its ears are larger than those of *pallidus* and *frustror*, but smaller than those of *peninsulæ*.

*Measurements.*—Type specimen, ♂ adult: total length, 1116; tail vertebræ, 320; hind foot, 200.

*Cranial measurements.*—Type specimen, ♂ adult, rather old: basal length, 170; basilar length of Hensel, 166; zygomatic breadth, 102;* palatal length, 88; mastoid breadth, 62; length of crown of upper carnassial tooth, 21.5.

### Canis frustror Woodhouse.

*Canis frustror* Woodhouse, Proc. Acad. Nat. Sci. Phila., V, 147, 1851.

*Type locality.*—Fort Gibson, at junction of Neosho River with the Arkansas, Indian Territory.

*Characters.*†—Similar to *C. peninsulæ*, but somewhat larger; colors paler, ears shorter, rostrum longer.

*Color.*—Muzzle cinnamon rufous; space between eyes and reaching half way to ears grizzled gray and fulvous; top of head, nape, and ears pale fulvous, deepest on the ears; rest of upper parts buffy-ochraceous, profusely mixed with black; under parts whitish, with a strong buffy-ochraceous suffusion across middle of belly; long hairs of throat conspicuously tipped with black, the black hairs running back over breast along median line; fore and hind legs and feet fulvous all round, deepest on outer side; upper surface of forearm and feet abundantly mixed with black, which forms an almost continuous stripe; antero-external face of thigh well

*The skull of the type is unusually broad across the zygomata. The normal zygomatic breadth in adult male skulls is about 97.

† The present description is from a specimen from Padre Island, Texas, which is unquestionably paler and less red than the animal of the interior. Audubon describes one from San Antonio, Texas, as having the neck reddish brown, "with bars under the throat and on the chest and belly of a reddish tinge." The type specimen of *C. frustror* is in the National Museum and, as pointed out by Baird, is hardly half grown.

sprinkled with black hairs which reach down more than half way to heel; under side of tail fulvous, white basally, and with hairs of distal half conspicuously tipped with black.

*Cranial and dental characters.*—Skulls from Padre Island and Nueces Bay are similar to those of *C. peninsulæ* from Lower California, except that they are somewhat larger, have decidedly longer rostrums and more elevated frontals. The elevation of the frontal shield posteriorly is greater than in any other Coyote. The teeth, though relatively smaller, are almost as large as in *peninsulæ*. In the Nueces Bay skulls the upper carnassial is peculiarly swollen and rounded anteriorly, with the inner cusp set back considerably behind the anterior plane of the tooth.

*Remarks.*—*Canis frustror* (assuming the name to apply to the Padre Island specimen above described) resembles *C. peninsulæ* from Lower California in general characters, differing chiefly in somewhat larger size, paler coloration, shorter ears, larger amount of black on forearm, and longer rostrum.

*Measurements.*—♂ young adult, Padre Island, Texas: total length, 1190; tail vertebræ, 320; hind foot, 200.

*Cranial measurements.*—♂ adult from Padre Island, Texas: basal length, 182; basilar length of Hensel, 179; zygomatic breadth, 102; palatal length, 94; mastoid breadth, 63; length of crown of upper carnassial tooth, 19.

### Canis cagottis (Hamilton Smith).

*Lycisceus cagottis* Hamilton Smith, Jardine's Nat. Library, Mammals, vol. IV, 164, 1839.

*? Canis nigrirostris* Licht., Abhandl. K. Akad. Wiss., Berlin (1827), pp. 105–106, 1830.

*Type locality.*—Rio Frio, between City of Mexico and Puebla, Mexico.

*Characters.**—Similar to *C. peninsulæ*, but slightly larger and redder, with somewhat shorter ears, larger teeth, and broader rostrum.

*Color.*—Muzzle bright ferruginous; top of head grizzled buffy-grayish and fulvous, the fulvous predominating, especially posteriorly; crown, nape, and ears fulvous, deepest on the ears; rest of upper parts grizzled fulvous, buffy, and black (the black-tipped hairs worn off in the Cerro San Felipe specimen, but probably very abundant and conspicuous in winter pelage); fore legs and feet dull fulvous, with very little black over wrists; hind legs and feet deep fulvous on outer side, the legs abruptly whitish on inner side and feet much paler on upper surface; under surface of tail fulvous, whitish basally; hairs of terminal third black-tipped.

*Cranial and dental characters.*—The skull of the adult male from Cerro San Felipe agrees with that of the type specimen of *Canis peninsulæ* in size and general cranial characters, but has the base of the rostrum very much thicker and more swollen, a broader and shorter palate (remarkably broad posteriorly), broader interpterygoid fossa, and much shorter mandible, which is strongly bellied under the carnassial and molars. The teeth are larger and heavier, particularly those of the lower

*The present description is based on a specimen (♂ adult) from the Cerro San Felipe, Oaxaca, Mexico, in summer pelage.

jaw. The upper carnassial is much more swollen and broadly rounded anteriorly, with a relatively insignificant inner cusp (*protocone*). The first upper molar is very large and broad and is broadly rounded on the inner side, without the posterior emargination of *C. peninsulæ*. The last upper molar is subquadrate and in contact with the first for nearly half the length of the anterior face. The lower premolars and carnassial are much larger, heavier, and more crowded than in *peninsulæ*, but the posterior molar is minute on one side and absent on the other (without trace of alveolus). A very young skull from the volcano of Toluca, which has not shed the milk teeth, has enormous audital bullæ; but very young skulls of wolves always have larger bullæ than adults.

*Remarks.*—Hamilton Smith's original description of *cagottis* is as follows: "The Caygotte of the Mexican Spaniards, and most probably the Coyotl of the native Indians, is a second species, but slightly noticed by travelers. Mr. William Bullock observed it near Rio Frio, in the Mexican Territory, and was informed by muleteers then with him that it was the Caygotte, a very fierce kind of wolf. The individuals he saw were in size equal to a hound, of a brownish rusty gray, with buff-colored limbs, and rather a scanty brush." While there is nothing distinctive about this description, it may be assumed, on geographic grounds, to apply to the animal from the Cerro San Felipe. For the same reason one would expect Lichtenstein's *C. nigrirostris* to belong here also; but Lichtenstein states that his animal has a black muzzle and short pointed ears, characters not possessed by any Coyote known to me. Lichtenstein's specimen was collected by Deppe at Real de Arriba, in the State of Mexico. If its skull is still in the Berlin Museum, its relations to the Cerro San Felipe skull may be easily ascertained. If not a freak it may be the large wolf of southern Mexico.

*Measurements.*—Adult ♂ from Cerro San Felipe, Oaxaca: total length, 1132; tail vertebræ, 304; hind foot, 195.

*Cranial measurements.*—Adult ♂ from Cerro San Felipe: basal length, 164; basilar length of Hensel, 160; zygomatic breadth, 98; palatal length, 84; mastoid breadth, 59; length of crown of upper carnassial tooth, 21.

### Canis peninsulæ sp. nov.

*Type locality.*—Santa Anita, Cape St. Lucas, Lower California. Type No. 74245, ♂ adult, U. S. National Museum, Department of Agriculture collection. Collected May 15, 1895, by J. E. McLellan.

*General characters.*—Similar to *C. ochropus* in size, large ears, and rich coloration, but colors darker and redder, underside of tail blacker; belly marked with black-tipped hairs; rostrum much broader.

*Color.*—Muzzle cinnamon rufous, the cheeks abundantly mixed with black hairs, almost forming a black patch under eyes; top of head grizzled grayish fulvous, mixed with black hairs between and above eyes; ears rich fulvous; upper parts buffy-ochraceous profusely mixed with black (under fur pale fulvous); underparts strongly washed with buffy-ochraceous or even pale fulvous, with numerous black-tipped hairs be-

tween fore legs and along middle of belly; long hairs of throat forming a strongly marked collar, tinged with buffy and conspicuously mixed with black-tipped hairs; fore and hind legs and feet fulvous; underside of tail fulvous, whitish basally; distal half with long hairs conspicuously tipped with black, forming a black veil over the fulvous.

*Cranial and dental characters.*—The skull which *Canis peninsulæ* resembles most closely is an adult male from the Cerro San Felipe, State of Oaxaca, Mexico, assumed to belong to the species named *cagottis* by Hamilton Smith. The skull of the type specimen of *peninsulæ* agrees with the Cerro San Felipe skull essentially in size and general characters, but the rostrum is not so short and broad (in the Cerro San Felipe skull it is remarkably broad posteriorly), and the lateral teeth, though large, are uniformly smaller and less swollen. The difference is most marked in the lower jaw. Compared with *C. frustror* from Texas, the skull of *peninsulæ* is shorter, the frontal shield lessel evated posteriorly, and the lateral teeth larger. Compared with its neighbor from the interior of California, *C. ochropus*, the rostrum is very much broader, the whole skull heavier and more massive, the horizontal ramus of the mandible deeper and more 'bellied,' and the lateral teeth larger and thicker.

*Cranial measurements.*—Type skull, ♂ adult: basal length, 169; basilar length of Hensel, 167; zygomatic breadth, 99; palatal length, 90; mastoid breadth, 57; length of crown of upper carnassial tooth, 20.5.

### Canis microdon sp. nov.

*Type locality.*—Mier, on Rio Grande River, State of Tamaulipas, Mexico. No. $\frac{37555}{39634}$, ♂ adult, U. S. National Museum, Department of Agriculture collection. Collected April 28, 1891, by William Lloyd. Original No. 478.

*Characters.*—Size small; coloration rather dark; upper surface of hind foot whitish; belly sprinkled with black-tipped hairs; carnassial and molar teeth very small.

*Color.*—Muzzle pure cinnamon rufous; top of head grizzled grayish and ochraceous; ears fulvous; rest of upper parts buffy-ochraceous, profusely mixed with black hairs (under fur buffy or buffy-ochraceous); under parts whitish between fore legs and between thighs; middle of belly buffy, with black-tipped hairs extending all the way across and also reaching forward along median line to long hairs of throat, which latter are strongly marked with black-tipped hairs; fore legs and feet fulvous, becoming whitish on inner side of leg; upper side of forearm strongly mixed with black; hind legs and feet pale fulvous on outer side, changing to white on inner side of leg and upper surface of foot; under side of tail pale buffy fulvous, whitish at base, and with hairs of distal half broadly tipped with black.

*Cranial and dental characters.*—Skull short and broad; muzzle and palate exceedingly short and broad; teeth small, particularly the carnassial and first upper molar.

*Remarks.*—*Canis microdon* does not require close comparison with any known wolf. From its nearest relative, *C. mearnsi*, it differs in shorter

rostrum, smaller upper carnassial, and more emarginate first upper molar. Externally it differs from *mearnsi* conspicuously, the upper parts being darker and the fulvous tints deeper, duller, and less extensive. In *mearnsi* the whole of the legs and feet are bright orange-fulvous. In *microdon* the white of the under parts reaches down on the inner side of the legs all the way to the wrists and ankles, and the upper surface of the hind feet is white.

*Canis microdon* is distantly related to *C. rigilis*, of the southwest coast of Mexico, but it differs from *rigilis* in numerous and important characters. The palate is shorter and broader, and the carnassial and molar teeth of the male are about the size of those of the female *rigilis*. The external differences are even more marked. The sides of the face lack the conspicuous black hairs of *rigilis;* the under fur of the back is buffy or pale buffy-ochraceous instead of fulvous; the belly is white and buffy, abundantly mixed with black-tipped hairs instead of everywhere saturated with fulvous; the fulvous of the fore and hind legs is pale and less extensive; the black of the forearm less extensive; the color of the hind legs and feet entirely different: the outer side only of the hind leg is fulvous, the inner side being white and the upper surface of the hind foot white or whitish. In *rigilis* the hind legs and feet are deep fulvous all round. The hairs of the distal half of the tail are broadly tipped with black, while in *rigilis* they are fulvous throughout.

*Measurements.*—Type specimen, ♂ adult: total length, 1070; tail vertebræ, 320; hind foot, 186; weight, 28 pounds.

*Cranial measurements.*—Basal length, 161; basilar length of Hensel, 158; zygomatic breadth, 93.5; palatal length, 84; mastoid breadth, 57; length of crown of upper carnassial tooth, 16.5.

### Canis mearnsi* sp. nov.

*Type locality.*—Quitobaquita, Pima County, Arizona. No. 59899, ♂ young adult, U. S. National Museum. Collected February 5, 1894, by Dr. Edgar A. Mearns. Original No. 2925.

*Characters.*—Size small; ears medium; coloration rich and bright, the fulvous tints exceedingly bright and covering the whole of the fore and hind legs and feet. Skull and teeth small.

*Color.*—Muzzle cinnamon rufous; space between eyes grizzled grayish and fulvous; top of head, nape, and ears rather light fulvous; rest of upper parts buffy-ochraceous bountifully mixed with black-tipped hairs (under fur bright buffy-ochraceous); under parts in pectoral and inguinal regions whitish, middle part of belly suffused all the way across with buffy-ochraceous; throat buffy, the long hairs black-tipped; fore and hind legs and feet bright orange-fulvous all round; upper side of fore

* Named in honor of Dr. Edgar A. Mearns, U. S. A., whose name will always be associated with the mammals of the Mexican boundary, and through whose courtesy I am indebted for the opportunity of describing the species.

legs moderately mixed with black; underside of tail pale fulvous, whitish at very base, hairs of distal half black-tipped; extreme end of tail black, usually with a few white hairs.

*Cranial and dental characters.*—Skull and teeth small and light as in *C. estor;* a little larger than in *C. microdon* from Mier, Tamaulipas.

*Remarks.*—*Canis mearnsi* is the handsomest of the Coyotes. It differs from *C. microdon* of the Lower Rio Grande region in slightly larger size and in the greater extent and much brighter tints of the fulvous parts. The fore and hind legs and feet are bright orange-fulvous all round; in *C. microdon* the fulvous is deeper and duller and the white of the inguinal region reaches down on the inner side of the hind leg to the ankle and covers the upper surface of the foot, and in the fore leg a white stripe reaches all the way down the posterior aspect of the leg to the wrist. Compared with *microdon*, the throat and middle part of the belly are more ochraceous and have fewer black-tipped hairs—the belly practically none. The skull and teeth of *mearnsi* are almost exactly like those of *estor*, but in coloration the two animals differ so widely as to require no comparison. Nevertheless, specimens collected by Dr. Mearns at Tinajas Altas, Arizona, are so much paler than typical *mearnsi* as to suggest intergradation.

*Measurements.*—Female adult from type locality: total length, 1100; tail vertebræ, 330; hind foot, 180 (measured in flesh by Dr. Mearns).

*Cranial measurements.*—Type specimen, ♂ young adult, not fully grown: basal length, 163; basilar length of Hensel, 160; zygomatic breadth, 83; palatal length, 88; mastoid breadth, 56.5; length of crown of upper carnassial tooth, 19.

### Canis estor sp. nov.

*Type locality.*—Noland's ranch, San Juan River, Utah. No. 57141, ♀ adult, U. S. National Museum, Department of Agriculture collection. Collected November 20, 1893, by J. Alden Loring. Original No. 1379.

*Characters.*—Size small; coloration pale, but not quite so pale as in *pallidus;* carnassial and molar teeth small.

*Color.*—Muzzle exceedingly pale fulvous; top of head grizzled grayish and ochraceous buffy; ears and nape ochraceous buff; upper parts buffy, sparingly mixed with black hairs; under parts whitish; long hairs of throat conspicuously black-tipped; some black-tipped hairs along median line of breast; outer side of fore legs bright buff, pale on inner side and on fore feet; outer side of hind legs and feet buffy-ochraceous; inner side of hind leg and upper surface of hind foot white or whitish; under side of tail ochraceous, becoming white basally, the hairs of distal half conspicuously tipped with black; black tip short.

*Cranial and dental characters.*—Skull and teeth similar to those of *C. mearnsi*, but lateral teeth slightly larger. Compared with typical *ochropus*, the rostrum is somewhat more swollen in the females and conspicuously more in the males.

*Remarks.*—*Canis estor* bears the same relation to *C. mearnsi* that *pallidus* does to *latrans*. Both are pale desert forms, slightly smaller than the

species from which they have been derived. The collection of the Biological Survey contains specimens of *C. estor* from the Mohave Desert, Death Valley, the Panamint and Inyo ranges, Owens Valley, the San Juan in southeast Utah, Flowing Springs and Humboldt Wells, Nevada, and Playa Maria Bay, Lower California. The latter are not typical.

*Measurements.*—Type specimen, ♀ adult: total length, 1052; tail vertebræ, 300; hind foot, 179. Measurements of an adult male from Granite Well (base of Pilot Knob), Mohave Desert: tail vertebræ, 340; hind foot, 195.

*Cranial measurements.*—Type skull, ♀: basal length, 159; basilar length of Hensel, 155; zygomatic breadth, 89; mastoid breadth, 57; palatal length, 84; length of upper carnassial, 17.2

### **Canis ochropus** Eschscholtz.

*Canis ochropus* Eschscholtz, Zoöl. Atlas, III, pp. 1–2, pl. 11, 1829.

*Type locality.*—'California.' (Specimens from Tracy, San Joaquin County, California, assumed to be typical.)

*Characters.*—Externally similar to *C. latrans* and *lestes*, but smaller, darker, and much more highly colored, with very much larger ears, and very much smaller skull and teeth.

*Color.*—Muzzle dull grizzled cinnamon rufous; top of head grizzled grayish fulvous; ears rich fulvous; nape sometimes fulvous; rest of upper parts buffy-ochraceous, profusely mixed with black hairs; under parts usually whitish, with a soiled yellowish wash across middle of belly, but sometimes suffused with pale fulvous; long hairs of throat strongly grizzled with black-tipped hairs, forming a conspicuous 'ruff,' the black-tipped hairs sometimes following the median line over the breast; fore and hind legs and feet dull fulvous all round, but paler on inner side and most intense on outer side of hind leg; upper side of forearm strongly marked with black; outer side of thighs strongly grizzled with black-tipped hairs; under side of tail pale fulvous, white basally, and tipped and edged with black; hairs of terminal third of under side of tail usually black tipped; extreme tip often white.

*Cranial and dental characters.*—The skull of *Canis ochropus* is disproportionally large for the size of the teeth, and the rostrum is long and slender. Compared with *C. estor*, probably its nearest relative, the skull is slightly larger, the rostrum decidedly longer and more slender, and the teeth very slightly larger. Compared with its neighbor, *C. lestes*, with which the skull agrees essentially in length, the entire cranium is narrower, particularly the rostrum, and the lateral teeth are so much smaller as to need no comparison.

*Measurements.*—Average of four females from Tracy, California: total length, 1110; tail vertebæ, 295; hind foot, 180.

*Cranial measurements.*—♂ adult, Tracy, California: basal length, 177; basilar length of Hensel, 174; zygomatic breadth, 94; palatal length, 98; mastoid breadth, 62; length of crown of upper carnassial tooth, 19. An

adult female from same place measures: basal length, 171; basilar length of Hensel, 167; zygomatic breadth, 94; palatal length, 90; mastoid breadth, 59; length of crown of upper carnassial tooth, 18.

### Canis vigilis sp. nov.

*Type locality.*—Manzanillo, Colima, Mexico. Type No. $\frac{32627}{44550}$, ♀ young adult, U. S. National Museum, Department of Agriculture collection. Collected February 6, 1892, by E. W. Nelson. Original No. 1840.

*Characters.*—Similar to *C. peninsulæ*, but darker and more highly colored, with more black on forearm and no black on under side of tail except at tip; upper carnassial and first molar much smaller.

*Color.*—Muzzle dull cinnamon rufous; top of head grizzled buffy fulvous and black; ears fulvous, upper parts buffy-ochraceous, profusely mixed with black (under fur fulvous); under parts strongly suffused with pale fulvous; throat collar with black tips strongly marked; fore and hind legs fulvous, as in *ochropus*, but deeper, especially on fore feet; black on upper side of forearm more extensive; outer side of thigh and leg strongly intermixed with black-tipped hairs, which reach down to or below knee; under side of tail dull pale fulvous, whitish basally, and tipped with black (hairs of under side anterior to black tip *not* tipped with black).

*Cranial and dental characters.*—The skull of the type specimen of *Canis vigilis*, a young adult female, agrees in general characters with an adult female *peninsulæ* from Cape St. Lucas, but is somewhat larger, with slightly broader rostrum and longer and more slender mandible. The upper carnassial and molar teeth, however, are very much smaller and show that the two animals belong to different sections of the group. Compared with *Canis mearnsi*, its nearest neighbor on the north, *C. vigilis* has a larger skull and very much smaller teeth, particularly the upper carnassial and first molar. The first upper molar is decidedly smaller than in any known form except *C. microdon*, from which it differs in being deeply notched posteriorly.

*Measurements.*—Type specimen, ♀ young adult: total length, 1155; tail vertebræ, 335; hind foot, 190.

*Cranial measurements.*—Type specimen: basal length, 166; basilar length of Hensel, 163; zygomatic breadth, 87; palatal length, 85; mastoid breadth, 59; length of crown of upper carnassial tooth, 17.5.

Vol. XI, pp. 35-37 March 13, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

U.S. NAT. BIOLOGICAL

# *COLLOMIA MAZAMA*, A NEW PLANT FROM THE VICINITY OF CRATER LAKE, OREGON.

BY FREDERICK V. COVILLE.

In August, 1896, while engaged with Mr. John B. Leiberg in an examination of the flora of Crater Lake and vicinity, in the state of Oregon, a violet-flowered Collomia was discovered. It was at once recognized as a probably new species, and a description was drawn in the field from the fresh specimens. In the transmission of our season's collection to the National Herbarium at Washington, however, the specimens of this plant, with several other species from the same vicinity, were lost, and even after a most careful search could not be traced. Fortunately a single complete set of the numbers collected had been withheld from the main shipment and stored at a remote and, for a portion of the winter, snowbound point in Idaho. The two sheets of specimens in this set finally reached Washington late in February and now make possible the publication of the species.

**Collomia mazama** sp. nov.

Plant perennial, few to many-stemmed from a slender tap-root, 15 to 30 centimeters high, below the inflorescence glabrous or with a few arachnoid viscid hairs on the stem and leaf-margins; stems terete, commonly 1 to 2 millimeters in diameter, simple up to the inflorescence; leaves oblong-lanceolate to lanceolate, commonly 3 to 6 centimeters in length, acute at apex and base, acutely and somewhat laciniately 3 to 5-toothed above, the uppermost entire and sessile, the lower often oblanceolate and tapering into a short narrowly margined petiole; inflorescence subcapitately cymose, sometimes with additional short-pedunculate clusters of flowers from one or two of the upper axils, glandular-hairy and strong-scented; bracts similar to the uppermost leaves, entire, the lower usually 2 to 3 cen-

timeters long and slightly exceeding the flower-cluster; calyx commonly 7 to 9 millimeters long, with the plicate sinuses characteristic of the genus, the lobes equaling the tube, triangular-lanceolate, acuminate, in fruit reaching a length of 5 or 6 millimeters; corolla about 15 millimeters long, deep blue to violet-purple, above the calyx expanding into a funnel-shaped throat, the narrowly oblong-obovate obtuse moderately divergent lobes about 5 millimeters in length; stamens slightly exserted, the anthers white, the filaments of somewhat unequal length, but inserted almost equally about half way from the sinuses to the base of the tube; ovule single in each cell of the ovary; style also exserted, the stigma 3-lobed; capsule about half as long as the fruiting calyx, narrowly obovate, truncate or depressed at the three-lobed summit, loculicidal in dehiscence, the 3 valves partially breaking away from the axis; seed about 3 millimeters long, olive-brown at maturity, linear-oblong, obtuse at both ends, sulcate on the axial face and attached to the placenta for almost its whole length, dull but without distinct markings, developing the characteristic spiracles of Collomia in water.

Type specimen in the United States National Herbarium, collected August 15, 1896, near Crater Lake, in the Cascade Mountains of Oregon, at an altitude of 1,900 meters, by Frederick V. Coville and John B. Leiberg, No. 429.

This showy and beautiful Collomia is remarkable for its perennial habit and the deep violet-blue color of its flowers. The glandular hairs of the calyx and peduncles give off the odor characteristic of most of the Collomias and some of the Phacelias. The only other blue-flowered, perennial species of the genus is *Collomia debilis* (Wats.) Greene, a variable plant, first collected in southern Utah, later in western Montana, the Cascade Mountains, and the northern Sierra Nevada, one or more of its various forms probably susceptible of varietal or specific separation.

The plant grows in abundance in slightly moist, open, sparingly grassy places in the forest, in the vicinity of streams and wet meadows, about five kilometers west of the upper camping ground at Crater Lake, and continues southeastward at about the same altitude, at least as far as the lower camping ground, about two and a half kilometers south of the rim of the lake. For one starting from the junction of the Rogue River and Fort Klamath roads and traveling northward toward Crater Lake, the most convenient and probably the first place for finding the plant is on the flat ground where the road first crosses the stream on which the lower camping ground is situated. Specimens were seen here, but not in abundance. At the time of collecting, the species was in full flower, and very few of the specimens had produced mature seeds.

COLLOMIA MAZAMA Coville

Mazama was the aboriginal designation of the Rocky Mountain goat, and was proposed also by Rafinesque as a generic name for the same animal. The name is now well known through the organization of mountain-climbers called the Mazamas, who, on August 21, 1896, with appropriate ceremonies, bestowed the name Mount Mazama upon the mountain within whose walls Crater Lake is enclosed. To this mountain and to the members of the organization itself this plant is now dedicated.

## EXPLANATION OF PLATE I.

Fig. *a*, *Collomia mazama*, flowering plant; *b*, flower; *c*, corolla, split down one side, showing the stamens and pistil within; *d*, fruiting calyx; *e*, capsule, after dehiscence, showing the valves and central axis; *f*, seed, viewed from the inner face. Figure *a* is two-thirds natural size, figures *b* to *e* enlarged two diameters, and figure *f* four diameters.

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# *DELPHINIUM VIRIDESCENS* AND *SAMBUCUS LEIOSPERMA*, TWO NEW PLANTS FROM THE NORTHWEST COAST.

BY JOHN B. LEIBERG.

In the collections of plants recently made by the United States Department of Agriculture in Oregon and Washington occur a red-berried elder which apparently should be separated from the other known species, and a remarkable larkspur with greenish-purple flowers, differing conspicuously in this respect from any other American member of the genus. Descriptions of these two plants are given herewith.

**Delphinium viridescens** sp. nov.

Stem 1 to 1.5 meters high from fascicled subfusiform roots, smooth below or sometimes minutely puberulent, the upper portion and the inflorescence densely pubescent with spreading yellow hairs from glandular flask-shaped bases; basal and cauline leaves glabrous, thin in texture, semicircular in outline, 8 to 10 centimeters broad, on petioles 12 to 16 centimeters long, deeply 5-parted, the divisions 3 to 5-lobed or cleft; upper cauline leaves pubescent, pinnately 3-parted, the divisions 3 to 7-cleft or broadly lobed, often stalked, diminishing upwards and becoming linear; inflorescence a strict narrow raceme about 30 centimeters long, in very robust plants reaching a length of 1 meter; flowers secund or sometimes subdistichous in the raceme, small for the size of the plant, on pedicels about 10 millimeters in length; lower sepals ovate-acuminate, about 8 millimeters long and 5 millimeters wide, pilose when young, becoming nearly glabrous in age, brown tinged with dull purple; spur straight, about 1 centimeter long; laminæ of lateral petals deeply cleft, densely pilose, about 5 millimeters long and 4 millimeters wide, dull purple in color, the claws narrow and about 6 millimeters in length; upper petals

about 1.7 centimeters long, including the short spurs, bidentate at the apex; follicles about 7 millimeters long and 2.5 millimeters wide, erect, pubescent; seeds nearly cubical, about 2 millimeters long and of nearly the same width, narrowly scarious-winged at the angles.

Collected near Peshastin, Okanogan County, Washington; altitude, 500 meters; No. 563, Sandberg and Leiberg, 1893. Type specimen in the United States National Herbarium.

A well-marked species and in aspect very different from all our northwestern forms. By its technical characters it occupies an intermediate position between *D. hesperium* and *D. distichum*. From the former it differs in its fusiform roots and much larger, thinner, glabrous, less divided basal leaves; from the latter species it is separated by its conspicuously yellow-pilose inflorescence, its less dissected cauline leaves, shorter follicles, and more open raceme. By the small, inconspicuous brownish or greenish-purple flowers the plant may be separated at a glance from any of the described North American species of Delphinium.

The plant is common in the wet meadows along the Wenatchee River, in the State of Washington. It is commonly a very robust species, sometimes reaching a height of 2 meters, the basal leaves often 20 centimeters broad.

### Sambucus leiosperma sp. nov.

Shrubby, 1.3 to 2 meters in height, forming with its spreading stems loose open clumps; pith of two-year-old shoots yellowish-brown; leaflets 5 to 7, varying from oblong to lanceolate, 4.5 to 8 centimeters in length, 1.5 to 3 centimeters in width, acute or acuminate, subsessile or short-petioled, sharply serrate, the apices of the teeth usually inflexed, smooth, or with a scattered short pubescence, especially on the petioles and the lower surface of the leaves along the midrib; stipules present on the flowering shoots, subulate, about 1 centimeter long and 0.5 millimeter wide; cyme oblong, somewhat flattened when in fruit, scabrous-puberulent, the branches membranaceously margined at the forks; flowers yellowish-white, drying the same color; berry scarlet, containing 3 to 5 seed-like nutlets, these very smooth, 2 to 3 millimeters long and about 1.5 millimeters wide.

Collected at Crater Lake, Oregon; altitude 2230 meters, No. 370, Coville and Leiberg, 1896. Type specimen in the United States National Herbarium.

This is the red-fruited elder of the higher Cascades of Oregon and Washington. It extends northward also into Alaska, as indicated by specimens in the National Herbarium, collected on Kadiak Island, in 1888, by Mr. C. H. Townsend, naturalist of the

'Albatross.' *S. pubens* Michx., *S. melanocarpa* Gray, and *S. leiosperma* form a group wherein the specific distinctions lie almost wholly in the color of the mature fruit and the character of the surface of the nutlet. To these three species should be added a fourth, the *S. callicarpa* of Greene (as restricted). The character of the hard covering of the nutlets in the latter species is still a matter of uncertainty, as the descriptions contain no reference to this point. Assuming, however, that certain specimens of red-fruited elder in the National Herbarium collected in central and southern California correctly represent that species, we can arrange the group as follows:

Mature fruit scarlet.
- Surface of nutlets transversely rugose.....*S. pubens.*
- Surface of nutlets puncticulate .....*S. callicarpa.*
- Surface of nutlets smooth .....*S. leiosperma.*

Mature fruit black.
- Surface of nutlets transversely rugose.....*S. melanocarpa.*

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PROCEEDINGS

OF THE

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MARINE BIOLOGICAL LABORATORY WOODS HOLE MASS.

# DESCRIPTIONS OF TWO NEW MURINE OPOSSUMS FROM MEXICO.

BY C. HART MERRIAM.

Two very different types of pigmy opossums are known from Mexico—the 'red' or rufous *Marmosa murina* (Linn.) and the pale ashy gray *M. canescens* (Allen). Mr. Nelson obtained representatives of *M. murina* at Chicharras and Huehuetan, *Chiapas*, and Juquila, *Oaxaca*, and of *M. canescens* at Santo Domingo de Guzman, Isthmus of Tehuantepec (the type locality); Puerto Angel, Tlapancingo, and Oaxaca, *Oaxaca*; Amolac, *Puebla*; Tlapa, Lochi, and Acapulco, *Guerrero*, and Hacienda Magdalena, *Colima*.

The specimens of the *M. murina* type are paler rufous than the typical form and have the middle of the face abruptly lighter, so that it is necessary to recognize them as a geographic race or subspecies. The Oaxaca specimens of the *canescens* type are markedly darker than typical *canescens* and differ in other respects. The form is here described as distinct under the name *M. oaxacæ*.

**Marmosa oaxacæ** sp. nov.

*Type* from City of Oaxaca, Oaxaca, Mexico. No. 68240, ♀ adult, U. S. National Museum, Biological Survey collection. Collected August 14, 1894, by E. W. Nelson and E. A. Goldman. Original No. 6571.

*Geographic distribution.*—Sonoran fauna of highlands of Oaxaca; limits of range unknown.

*General characters.*—Size small, smaller than a half-grown rat; similar to *M. canescens* (Allen), but very much darker, and with the dark of upper parts reaching wrists and ankles; feet and ears smaller.

*Color.*—Upper parts from just behind eyes to base of tail dark sepia brown (almost dusky in fresh pelage); under parts buffy yellow, much deeper than in *canescens;* median face patch (from nose to behind eyes) pale buffy brown; orbital rings large and black, connected posteriorly by dark top of head; dark color of upper parts reaching wrists and ankles; tail bicolor, dark above, whitish beneath.

*Cranial characters.*—Skull and teeth similar to those of *D. canescens,* but frontal plate a little broader. Measurements of skull of type specimen: basal length, 29; zygomatic breadth, 18.5; palatal length, 17; interorbital breadth, 4.8; greatest breadth of frontals, 8.

*Remarks.*—*Marmosa oaxacæ* is an upland or Sonoran representative of the tropical *M. canescens* of J. A. Allen. The type of *canescens* came from Santo Domingo de Guzman, on the Isthmus of Tehuantepec. Specimens collected by Mr. Nelson extend its range northwesterly over the arid tropical hills and lowlands of the States of Oaxaca, Guerrero, and Michoacan to the Hacienda Magdalena, in Colima. A specimen was obtained as far inland as Amolac, Puebla.

*Marmosa oaxacæ,* on the other hand, inhabits the Sonoran highlands of Oaxaca, at the extreme southern end of the tableland of Mexico—a very different fauna. The two forms may be found to intergrade where the Sonoran fauna passes into the tropical, but no evidences of intergradation are to be seen in the eleven specimens of *canescens* obtained by Nelson and Goldman. The new species rests on two specimens—the type, an old female, and an immature male—both from Oaxaca

*Measurements* (of type specimen in flesh).—Total length, 263; tail, 144; hind foot, 18.

### Marmosa murina mexicana subsp. nov.

*Type* from Juquila, Oaxaca. No. 71526, ♂ im., U. S. National Museum, Biological Survey collection. Collected February 28, 1895, by E. W. Nelson and E. A. Goldman. Original No. 7571.

*Geographic distribution.*—Southern Mexico, in States of Oaxaca and Chiapas.

*General characters.*—Similar to *M. murina,* but rufous of upper parts decidedly paler, and middle of face from between eyes to nose abruptly buffy [in true *murina* the rufous reaches forward to nose]; ears smaller.

*Color.*—Upper parts from between eyes posteriorly to base of tail cinnamon rufous, gradually fading on sides to ochraceous buffy on belly; orbital ring black and reaching anteriorly to whiskers; middle of face from end of nose to between centers of eyes buffy, in marked contrast to rufous of top of head.

*Cranial characters.*—Skull similar to that of *M. murina,* but interparietal broader and shorter.

*Measurements.*—Type specimen (not full grown): total length, 274; tail, 162; hind foot, 20. An adult male from Chicharras, Chiapas: total length, 330; tail, 186; hind foot, 24.

Vol. XI, p. 45 March 16, 1897

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# *PHENACOMYS PREBLEI*, A NEW VOLE FROM THE MOUNTAINS OF COLORADO.

BY C. HART MERRIAM.

During the past few years the field parties of the Biological Survey have collected numerous specimens of *Phenacomys* in the mountains of Idaho, Montana, and Oregon. All of these specimens belong to the species described by me in 1891 under the name *P. orophilus* (N. Am. Fauna, No. 5, p. 66, August, 1891), the type of which came from the Salmon River Mountains, in Idaho.

In August, 1895, one of my assistants, Mr. Edward A. Preble, trapped a new species on the side of 'Twin' or 'Lilies' Peak, near Longs Peak, Colorado, at an altitude of about 2,700 meters (approximately 9,000 feet). "The locality was perfectly dry and had been covered by a forest, most of which had fallen." The species may be described as follows:

**Phenacomys preblei** sp. nov.

*Type* from Longs Peak, Colorado. No. 74513, ♂ adult, U. S. National Museum, Biological Survey collection. Collected August 12, 1895, by Edward A. Preble. Original No. 647.

*General characters.*—Size rather small; color very pale and decidedly ochraceous.

*Color.*—Upper parts clay color, suffused with ochraceous buff and heavily lined on the back with black-tipped hairs; feet soiled whitish; under parts white, with a yellowish tinge, the plumbeous under color showing through.

*Cranial and dental characters.*—Skull similar to that of *P. orophilus*, but somewhat smaller, with posterior ends of ascending branches of premaxillæ more broadly expanded; interorbital ridges more strongly developed; jugal decidedly narrower and hardly, if at all, mortised into maxillary arm of zygoma; end of pterygoids swollen where they articulate with audital bullæ.

*Measurements* (type specimen).—Total length, 130; tail vertebræ, 30; hind foot, 17.

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PROCEEDINGS

OF THE

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BIOLOGICAL LIBRARY MARINE

# NOTES ON THE LYNXES OF EASTERN NORTH AMERICA, WITH DESCRIPTIONS OF TWO NEW SPECIES.

BY OUTRAM BANGS.

The genus *Lynx*, constituting a well marked group of cats with many species in both North America and Eurasia, was divided by Gray, in 1867,* into two subgenera, *Lynx* and *Cerraria*. The division was made on wholly inadequate external characters, but the great differences, both cranial and external, which are now known to exist, fully warrant the recognition of Gray's two groups.

Mr. F. W. True, in 1887,† pointed out for the first time, I believe, the more important cranial characters that separate the members of the subgenera *Lynx* and *Cerraria*. Some European authorities, however, lump together as mere races the very different species of these two groups and will not even recognize the genus *Lynx* itself as more than subgenerically distinct from *Felis*. American mammalogists, on the other hand, agree in considering *Lynx* quite worthy of full generic distinction.

## Genus LYNX Rafinesque.

Dental formula $i\ \frac{3-3}{3-3}$, $c\ \frac{1-1}{1-1}$, $pm\ \frac{2-2}{2-2}$, $m\ \frac{1-1}{1-1} = 28$. Legs and arms long and powerful; body short; whole build dog-like; tail very short; pelage full; a ruff of long hairs around throat; ear with decided pencil of long

* P. Z. S., 1867, p. 267. (The genus was called *Lynchus* by Gray.)

† Proc. U. S. Nat. Mus., 1887, p. 8.

hairs; skull short and round; audital bullæ small, flat and broad; nasals, taken together, cone shaped (the nasals of *Felis*, taken together, are broadly truncate posteriorly); no distinct lobe on inner side of smaller upper premolar.

Subgenus LYNX Rafinesque.

Feet and hands very large, the pads small; tail very short; pelage long and loose; ear with long pencil of hairs (even in the very young kittens); skull broad; rostrum wide; audital bullæ very small and flat; palatal exposure of presphenoid broadly flask shaped (Fig. 1); anterior

Fig. 1.—Postpalatal region of *Lynx*.

Fig. 2.—Postpalatal region of *Cervaria*.

condyloid foramen *not confluent* with foramen lacerum posterius; maxilla separated from nasals by the meeting (or nearly meeting) of the descending arm of frontal and ascending arm of premaxilla; canine teeth slender; lower molar tooth very large.

Subgenus CERVARIA Gray.

Feet and hands small (in *floridanus*) to medium (in *ruffus*) the pads large; pelage full but close; tail medium (longer than in *Lynx*); ear with a short pencil of hairs; skull narrow; rostrum narrow and 'nipped in' from sides; audital bullæ deep and long; palatal exposure of presphenoid strap shaped or slightly triangular (Fig. 2); anterior condyloid foramen *confluent* with foramen lacerum posterius; maxilla touching nasals for some distance (much as in genus *Felis*); canine teeth strong; lower molar tooth small.

In North America the subgenus *Lynx* contains the northern species and the subgenus *Cervaria* the southern species. The same is probably true of the Eurasian members of the genus *Lynx*, although I have been unable to find a description of the skull of any of the more southern species. Mr. True examined some skulls of the Swedish *Lynx* and found that it belongs in the restricted subgenus *Lynx*.

The subgenus *Lynx* is represented in eastern North America by two forms:

1. *Lynx canadensis* (Geoff.) occupying the whole of Boreal North America from Maine and northern New York to Alaska, but now very rare and apparently becoming extirpated in the east.

2. *Lynx subsolanus* sp. nov., an island form, confined to Newfoundland.

The subgenus *Cervaria* is represented in eastern North America by three forms:

1. *Lynx ruffus ruffus* (Guldenstadt) ranging over the whole central region from about northern Georgia north to the coast of Maine.

2. *Lynx ruffus floridanus* (Raf.) occupying the whole of Florida, and extending west along the Gulf coast to Louisiana and north on the Atlantic coast certainly to southern Georgia. *L. floridanus* is so strongly marked a form that I think it will prove a distinct species when specimens are procured at points where it meets the range of *ruffus*. It is large, but lightly built, with very small feet and hands, and darker than *ruffus*, from which it differs in color pattern also, being much spotted and having black waved streaks on the back. The skull (pl. i, fig. 4) presents the extreme of slenderness and 'nipping in' of the rostrum.

3. *Lynx gigas* (sp. nov.) confined to the Province of Nova Scotia, where it is apparently insulated. It is a much larger and more powerful animal than *L. ruffus*, of a brighter and deeper color, with a larger skull, flatter audital bullæ and much heavier dentition.

## Descriptions of New Species.

### **Lynx subsolanus** sp nov.

(Pl. II, Fig. 2.)

*Type* from Codroy, Newfoundland. ♂ old adult, No. 1190, collection of E. A. and O. Bangs. Collected by Ernest Doane June 13, 1894.

*General characters.*—Size and proportions as in *L. canadensis*, from which it differs in much darker and richer color.

*Color.*—Type (in summer pelage): Under fur on sides cinnamon rufous throughout, on back black basally and hazel terminally; long hairs (much longer than those of under fur) of three kinds: (1) wholly black; (2) wholly dull hazel, and (3) banded with hazel, yellowish gray, and black; predominating color of whole upper parts black and hazel irregularity varied; face dull yellowish gray, upper surface of ear black, with a large triangular spot of dark gray, pencil black; legs and arms dull yellowish hazel, faintly spotted with darker; tail very short, dull hazel above, dirty white below, black at tip; belly wood brown with irregular spots of black, the long hairs dirty white.

Kitten about one-third grown (No. 5754 from Bay St. George, Newfoundland). Whole upper parts (including legs and arms) yellowish cinnamon, somewhat spotted and 'lined' with blackish; ears with long pencil, as in the adult; tail cinnamon with black tip; under parts varying from soiled white to wood brown and faintly spotted with black.

*Cranial characters.*—The skull of *L. subsolanus* (pl. i, fig. 2) is similar in all its characters to that of *L. canadensis*.

Size of an old adult ♂ skull from Bay St. George, Newfoundland.* (No. 3798, collection of E. A. and O. Bangs): basilar length, 112.2; occipitonasal length, 125.4; last upper molar to foramen magnum, 70.6; zygomatic breadth, 95; mastoid breadth, 58.2; breadth across roots of canines, 37.6; greatest length of single half of mandible, 93.2.

*Size.*—Type (♂ old adult): total length, 919; tail vertebræ, 109; hind foot, 219; ear from notch, 80.

**Lynx gigas** sp. nov.

(Pl. II, Fig. 1.)

*Type* from fifteen miles back of Bear River, Nova Scotia. ♂ old adult, No. 4951, collection of E. A. and O. Bangs. Taken by a trapper December 11, 1895 (measured, skinned, and sexed by O. Bangs).

*General characters.*—Very stout and powerfully built; size very large; colors rich with much black on upper parts; triangular spot of gray on ear very small; skull large and strong; audital bullæ broader and flatter than in *L. ruffus;* dentition, especially canine teeth, very much heavier than in *L. ruffus.*

*Type* (in winter pelage): Under fur cinnamon rufous, paling off on sides and becoming more intense on back and on inner sides of flanks; long hairs, cinnamon and black, the black irregularly mixed in spots and streaks which are most conspicuous along middle of back; ears with short pencil of black hairs; upper surface of ear black, with small triangular spot of dark gray; tail above dull cinnamon, somewhat mixed with black, below white, tip black; under parts dull white, spotted with black, a pectoral collar of cinnamon; under surfaces of feet and hands black.

*Cranial characters.*—Skull (pl. i, fig. 1) very large and massive; audital bullæ broad and flat; basioccipital wide; distance across roots of canine teeth great; mandible very heavy.

Size of the type skull (♂ old adult): basilar length, 117.2; occipitonasal length, 132.2; last upper molar to foramen magnum, 72.6; zygomatic breadth, 98.4; mastoid breadth, 60; breadth across roots of canines, 39.2; greatest length of mandible, 92.

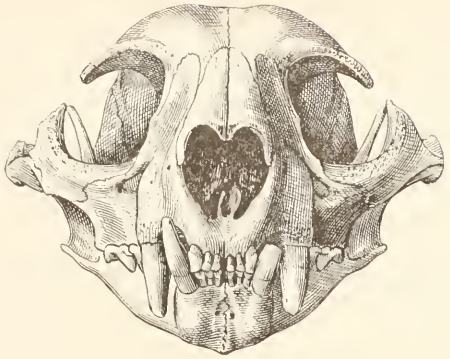
A skull of *Lynx ruffus ruffus* from East Hartford, Connecticut † (♂ old adult), measures: basilar length, 111; occipitonasal length, 124.8; last upper molar to foramen magnum, 70.2; zygomatic breadth, 94; mastoid breadth, 55.8; breadth across roots of canines, 34.4; greatest length of single half of mandible, 86.2.

*Size.*—The type (♂ old adult): total length, 1001; tail vertebræ, 177; hind foot, 200.

*The skull of the type is somewhat injured by a rifle bullet which passed through it lengthwise.

† No. 1405, collection of Charles F. Batchelder, Cambridge, Mass.

1



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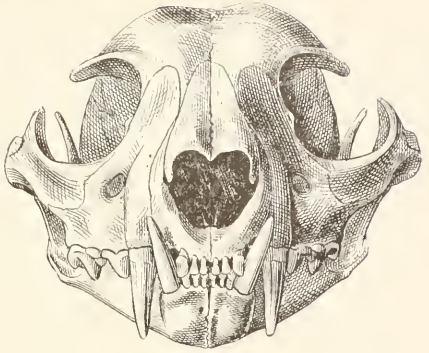

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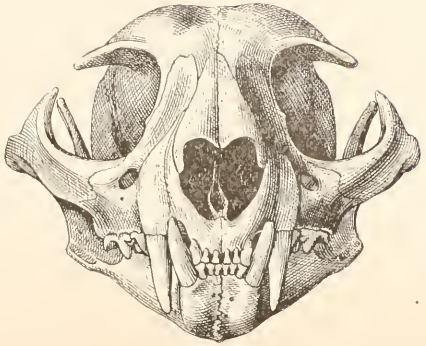

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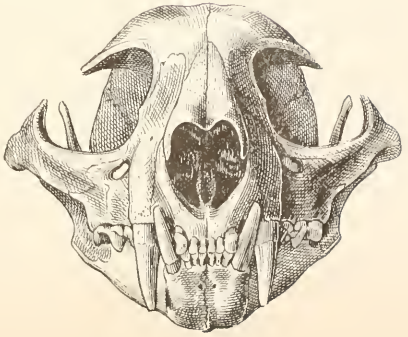

1 *Lynx gigas* 2 *L. subsolanus* 3 *L. ruffus* 4 *L. floridanus*

## EXPLANATION OF PLATE II.

Figures about one-fourth life size. (Drawn by Dr. J. C. McConnell.)

Fig. 1. *Lynx* (*Cervaria*) *gigas* Bangs, ♂ old adult (type), Bear River, Nova Scotia. (No. 4951, Bangs collection.)

Fig. 2. *Lynx* (*Lynx*) *subsolanus* Bangs, ♂ old adult, Bay St. George, Newfoundland. (No. 3798, Bangs collection.)

Fig. 3. *Lynx* (*Cervaria*) *ruffus ruffus* (Güld.), ♂ old adult, East Hartford, Connecticut. (No. 1405, collection of Chas. F. Batchelder.)

Fig. 4. *Lynx* (*Cervaria*) *ruffus floridanus* (Raf.), ♂ old adult, Oak Lodge, east peninsula, opposite Micco, Florida. (No. 3504, Bangs collection.)

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTION OF A NEW RED FOX FROM NOVA SCOTIA.

BY OUTRAM BANGS.

For some years I have known of the existence in Nova Scotia * of a large red fox, much larger and of a deeper color than the small yellowish red *Vulpes pennsylvanica typica* (Bodd.) of the Central States. I have had some difficulty in getting specimens of this fox, but now have a series of five skins and six skulls from Digby, Bear River, and Annapolis, Nova Scotia. Unfortunately my specimens are mostly females or young. I have no skin and only one skull of a very old male. The old males are often of great size. My friend, H. A. P. Smith, Esq., of Digby, who has killed very many, has several times taken them weighing close to twenty pounds.

The Nova Scotia fox presents all the color phases known as 'cur,' 'cross,' 'silver gray,' and 'black' foxes. One of my specimens is a fine 'cross.' The new fox in its normal red pelage is a very beautiful animal, and the fur is well known to dealers, who pay much higher prices for it than for the fur of the southern red fox.

The new form may be known as:

**Vulpes pennsylvanica vafra** subsp. nov.

*Type* from Digby, Nova Scotia, No. 116, female, old adult. Collection of E. A. and O. Bangs. Collected November 3, 1893, by O. Bangs.

*General characters.*—Size considerably larger than *Vulpes pennsylvanica*

*This large form probably ranges throughout Boreal Eastern North America generally.

*typica*. General color of upper parts bright ferruginous instead of tawny ochraceous, as in *V. pennsylvanica typica*.

*Color* (the type in normal red phase).—Whole upper parts deep, bright ferruginous, somewhat mixed with yellow-tipped hairs on face and rump, this color extending around sides and almost meeting on belly; abdomen, inner sides of flanks, and upper lip white; throat, chin, and central line along belly grayish white; tail ferruginous with a conspicuous white pencil, many of the hairs black tipped; upper surface of ears black, edged all round with yellowish ferruginous and dirty white inside; hand and forearm black, gradually shading into ferruginous at elbow; foot black, slightly mixed with ferruginous, the black extending up flank in a narrow line.

*Cranial characters.*—Skull larger than that of *V. pennsylvanica typica* from the Central and New England States; rostrum broader; distance across roots of canines much greater; dentition much heavier.

Size of an old adult ♀ skull (the type): basilar length (basion to front of premaxillary), 133; occipitonasal length, 133.2; zygomatic breadth, 75.8; mastoid breadth, 46; greatest breadth of rostrum, 24; greatest length of single half of mandible, 106.8. Size of an old adult ♂ skull (No. 2001, Bangs collection, topotype): basilar length, 134.2; occipitonasal length, 135.2; zygomatic breadth, 79.4; mastoid breadth, 47; greatest breadth of rostrum, 25.8; greatest length of single half of mandible, 110.4. Two skulls of *V. pennsylvanica typica* of exactly corresponding ages measure as follows: ♀ old adult, from Hampton, Connecticut, No. 4286, Bangs collection: basilar length, 120; occipitonasal length, 122.6; zygomatic breadth, 71.6; mastoid breadth, 44; greatest breadth of rostrum, 21; greatest length of single half of mandible, 96.8. ♂ old adult, from Waltham, Massachusetts, No. 115, Bangs collection: basilar length, 123.4; occipitonasal length, 123.6; zygomatic breadth, 71.8; mastoid breadth, 44; greatest breadth of rostrum, 21.8; greatest length of single half of mandible (estimated, tip imperfect), 100.

*Size.*—Female, old adult (the type): total length, 1077; tail vertebræ, 401; hind foot, 166. Mail, young adult, from Annapolis, Nova Scotia (No. 1991, Bangs collection): total length, 1087; tail vertebræ, 403; hind foot, 173. Two specimens of *V. pennsylvanica typica* of corresponding ages (♀ old adult from Hampton, Connecticut, No. 4286, Bangs collection, and ♂ young adult from Pittsfield, New Hampshire, No. 650, Bangs collection) measure respectively: total length, 945; tail vertebræ, 340; hind foot, 143; and total length, 1028; tail vertebræ, 375; hind foot, 157.

*Remarks.*—As some European writers still persist in considering the American red fox a mere variety of the old world *Vulpes vulpes*, it may be well to point out a few of the characters by which these wholly distinct animals can always be distinguished.

The European red fox (*V. vulpes*) has more white on the upper lip and less black on the legs and arms than the American (*V. pennsylvanica*). The skulls of the two can always be told apart. *V. vulpes* has a heavy, massive skull, with deep interorbital constriction, narrow frontals, and a very wide palate. *V. pennsylvanica* has a much lighter skull, which is

broader between the orbits and narrower across the palate. There is also a very striking difference in the upper outline of the skulls when viewed in profile. This line is nearly straight in *Vulpes vulpes*, while in *V. pennsylvanica* it dips decidedly in front of the root of the zygoma and rises between the orbits.

I can find no name based on the large northern red fox.

Desmarest, in 1820, called the 'cross fox' *Canis decussatus*, and refers to Geoffroy Collection du Museum.* It is given as an inhabitant of "L'Amérique Septentrionale." As all three races of our red fox occasionally show this color phase, the name cannot be said to apply to one more than another.

Desmarest's *C. argentatus* is said to inhabit America and Asia. *Canis argentatus* 'The silver fox' dates (so far as I can ascertain) from Shaw's General Zoölogy, 1800–1826, and is based on Pennant, who says it inhabits the forests of Louisiana (in his day the whole lower Mississippi Valley). This name must therefore have been given to the 'silver gray' phase of the Southern red fox *V. pennsylvanica typica*.

Richardson in Fauna Boreali-Americana, 1829, gives three 'red foxes':

*Canis* (*Vulpes*) *fulvus* (Desmarest).†

*Canis fulvus* var. *β decussatus* (Geoffroy, Coll. du Mus.).

*Canis fulvus* var. *γ argentatus* (Desmarest).

Richardson's *Canis fulvus* is not *Vulpes pennsylvanica typica*, but the subspecies named *Vulpes macrourus* by Baird in 1852. Richardson assigns no different range to his var. *argentatus*, which must be assumed to be the 'silver gray' phase of the same form. He quotes a description of var. *decussatus* from Joseph Sabine's Appendix to Franklin's Journey, 1823, p. 656. All Sabine says as to locality, under the head of this variety, is "The specimen received from Capt. Franklin and that from the Hudson Bay Company nearly correspond." The animal described might have been an example of any form in the 'cross' phase and most probably was the prairie fox, *V. pennsylvanica macroura* (Baird).

While all our red foxes sometimes present the various different color phases, still 'cross' and 'silver gray' foxes are more common northward. This corresponds with the general tendency among our mammals which are subject to melanism. It is now known that black woodchucks and black gray squirrels are more often met with at the northern part of the range of these species, and the same will probably prove to be the case with many other species.

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* This reference I have been unable to verify, only one copy of the work being known to exist, and that in the Paris Museum. Under the head of *Canis decussatus* Geoff. in Nouveau Dictionnaire D'Histoire Naturelle, 1816, vol. 6, p. 518, appears the following, apparently written by Desmarest: "Cette espèce est du nord de l'ancien continent. Selon M. Cuvier elle ne differe point de celle du renard commun." From this I infer that Geoffroy gave the name *Canis decussatus* to the European 'Cross Fox.'

† *Canis fulvus* of Desmarest, 1820, is, of course, antedated by *Canis vulpes* var. *δ pennsylvanicus* Boddært, 1785, as shown by Gray (P. Z. S., 1868 p. 518).

VOL. XI, PP. 57-60 MARCH 23, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# THE ITINERARY OF JOHN JEFFREY, AN EARLY BOTANICAL EXPLORER OF WESTERN NORTH AMERICA.

BY FREDERICK V. COVILLE.

Among the botanical explorers who have done important work in North America, John Jeffrey is one of the most obscure. It has been known that he was a Scotchman, that about the year 1850 he was sent to our northwest coast by patrons of botanical science in Edinburgh, and that he made important collections; but it is not known* in what town or in what year he was born nor in what country or in what year he died. One very rare pamphlet, issued in the year 1853, which contains descriptions of *Pinus jeffreyi* and a few other new species, and has been seen by few American botanists, indicates that he had visited the coastal region of Oregon and the mountains of northern California. It has not been known that ten other pamphlets or circulars regarding his work are in existence, and that Jeffrey traveled from Hudson Bay to the Rocky Mountains of British America and the shores of the Pacific Ocean, and from the mouth of the Gila River, in Arizona, to the Fraser River, in British Columbia.

Through the kindness of Professor Isaac B. Balfour, of Edinburgh, and Professor C. S. Sargent, of the Arnold Arboretum, a mass of documents, both manuscript and printed, relative to Jeffrey and his work has been placed in my hands for examination, a courtesy which I have to acknowledge with grateful appreciation. From these papers the following sketch has been chiefly drawn:

*According to Britten and Boulger, Biographical Index of British and Irish Botanists, 1893, p. 93.

On the 22d of November, 1849, was held at the Botanical Gardens in Edinburgh a meeting of "gentlemen interested in the promotion of the arboriculture and horticulture of Scotland." This meeting resulted in a decision to send to western North America a botanist, who should collect the seeds of trees, shrubs, and other plants suitable for horticultural purposes, in the region traversed by David Douglas, "to complete his researches, and to extend them into those parts of the country not fully explored by him." It was decided to raise the necessary funds through subscribers, who should share in the specimens received from the collector.

The subscribers formed themselves into an organization, under the chairmanship of Professor J. H. Balfour, designated in their official proceedings as the "Oregon Botanical Association." The work of their collector was called usually the "Botanical Expedition to Oregon," sometimes the "Oregon Botanical Expedition." Eleven quarto circulars of one to four pages each (in one case with five lithograph plates), issued to the members of the association by Andrew Murray, its secretary, have been examined by the writer—doubtless a complete set—and from the miscellaneous dates, numbers, and localities given in them the itinerary of the collector has been compiled.

November 20, 1850, Mr. Murray reported, on behalf of an executive committee, that the services of Mr. John Jeffrey had been secured, and that with authentic credentials and the hearty coöperation of the Hudson's Bay Company he had sailed from London early in June, 1850, for Hudson Bay.

On April 7, 1851, Jeffrey wrote Professor Balfour from Jasper House, in the British Rocky Mountains, on the headwaters of the Athabasca River, stating that he had left York Factory, on Hudson Bay, August 20, 1850, and reached Cumberland House, on the Saskatchewan River, October 8, where he remained till the early part of January, 1851. He had then proceeded up the Saskatchewan to Edmonton House, overland to the Athabasca, and up that river to Jasper House, where he arrived March 21. A small and unimportant collection from the eastern side of the Rockies was shipped about this time and reached Edinburgh late in the year.

From Jasper House Jeffrey crossed the Rocky Mountains at Athabasca Pass, between Mount Brown and Mount Hooker, and coming to the Columbia River at the point where it bends ab-

ruptly around the northern end of the Selkirk Mountains, descended it to Fort Colville, on the Columbia a few miles above the mouth of Colville River, in the present state of Washington. He arrived at this place about May 13, 1851.

On July 9 Jeffrey was at the junction of the Okanogan and Similkameen (spelled by him Semekemele) rivers, in Washington, just south of the present British boundary, having reached that point doubtless by descending the Columbia river from Fort Colville to the mouth of the Okanogan and following the latter to its forks. He then ascended the Similkameen and its branch, the Tulameen, stopping at Campment des Femmes, near the mouth of Otter River, a northern tributary of the Tulameen, and proceeded across the country westward to Fraser River. He appears to have descended immediately to Vancouver Island, for the circulars mention certain plants collected there in July, 1851, and then to have returned to the Fraser. He went up this river at least as far as 50° 23′ north latitude, collecting from August 11 to September 27 to an altitude of 6,000 and even 8,000 feet in the mountains east of the river. He made collections also in the autumn on Mount Baker, in extreme northwestern Washington, one entry being as late as October 2.

The winter of 1851–'52 and the following spring, until at least April 24, Jeffrey spent on Vancouver Island, probably at Victoria. In May, 1852, he was at Fort Nisqually, Washington, at the head of Puget Sound, and in the same month he went on southward to Fort Vancouver (site of the present town of Vancouver, Washington), on the Columbia River. Remaining here for about two months, he next engaged in an expedition, from about August 1 to November 1, to the valleys of Umpqua, Klamath, Trinity, and Rogue rivers, Siskiyou Mountains, Cascade Mountains, and Mount Shasta, all in southern Oregon and northern California. On December 4, 1852, he was on Mount Jefferson, in the Cascade Mountains of Oregon, about latitude 44°.

Jeffrey passed the winter of 1852–'53, like the preceding one, on the lower Columbia. In the following season, 1853, he repeated in part his work of the preceding year, collecting in the Umpqua Valley and the Siskiyou Mountains on Clear Creek, Mount Shasta, Applegate River, Scott Mountain, and the Coast Range, on the Sierra Nevada in latitude 38°, in the Sacramento Valley, and the American fork of the Sacramento, and at San Francisco Bay.

The plants of this season's collecting, 1853, from the localities mentioned above, were the last that Jeffrey sent to Edinburgh, and his employment by the association practically ceased at this time, his original contract being for three years' service. The following extract from a letter received by Andrew Murray in Edinburgh from his brother, W. Murray, who was living at San Francisco, gives a hint of Jeffrey's probable movements:

"San Francisco, *19 May, 1854.*

"I yesterday received your letter enclosing one for Jeffrey. * * *

"I went again to McKinlay, Garrioch & Co., and they have deciphered his address to be Fort Yuma, on the Gila River (just where it joins the Colorado), where he says he will probably be until the 1st of August, and directs his letters to be forwarded by Adams & Co.'s Express to the care of their agent at San Diego, Mr. F. Ames.

"I accordingly put his letter in an envelope addressed in conformity with these instructions and took it to Adams & Co.'s Express. * * *

"They, McKinlay, Garrioch & Co., say he is a hard working, enthusiastic, very steady, and temperate man, and that just before starting for San Diego he was some three weeks arranging the proceeds of his excursions, and they doubt not that he despatched them. He had been for some weeks sick before that, which accounts for part of the long stay in San Francisco. * * *

"I met the consul just now and he said he had received another letter for Jeffrey. I forwarded it along with yours. The consul says that he (Jeffrey) never called at the consulate; that there had been quite a budget of letters and other things there for him, which have since been forwarded to him by McKinlay, Garrioch & Co. at the same time as your previous letter. * * *

"You will possibly think that I ought to have been able to find out Jeffrey while he was here, but at that time I neither knew that McKinlay, Garrioch & Co. were acquainted with him, nor that Allan, Lowe & Co. were connected with the Hudson's Bay Co."

Mr. John Ballender, who knew Jeffrey at Fort Vancouver in 1852 and 1853, writing to Andrew Murray under date of February 1, 1854, gives a brief outline of Jeffrey's movements in those years, and says:

"If this can be in any way of service to you I shall be most happy, as I feel very anxious respecting the fate of poor Jeffrey, knowing well that if he followed up the route hinted to me he had some dangers of no very trifling nature to contend with."

No further information about Jeffrey appears to have reached Edinburgh, but to those who know the terrible chances taken by a man attempting a trip to Yuma in the fifties, alone, there is little doubt that he perished of thirst upon the Colorado Desert.

Vol. XI, pp. 61-65 April 21, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON.

MARINE BIOLOGICAL LABORATORY LIBRARY

# THE TECHNICAL NAME OF THE CAMAS PLANT.

BY FREDERICK V. COVILLE.

One of the principal native food plants of several Indian tribes on our Northwest coast and in the northern Rocky Mountains is the camas plant, a member of the family Liliaceae, bearing a raceme of blue flowers and having a starchy edible bulb. It commonly passes under the technical name *Camassia esculenta*, a name which, it now appears, cannot be maintained.

In the year 1813 Ker, in the Botanical Magazine, plate 1574, figured and described a *Scilla esculenta*, the plants on which it was based having been grown at Fraser's nursery, London, from stock imported into England by Thomas Nuttall. It is necessary at the outset to identify this plant of Ker's.

From the description and the plate, no one would question that the original *Scilla esculenta* is the plant commonly called *Camassia fraseri*, but the supplementary statement made by Ker on the strength of a communication from Pursh, that it serves "as a principal article of food" to "certain Indians in the neighborhood of the [upper] Missouri River" throws doubt on this identification, for this statement cannot apply to *Camassia fraseri*. A knowledge of the origin of the plant sent to England by Nuttall would settle the matter, for the ranges of *Camassia fraseri* and *C. esculenta* are separated by a wide stretch of territory, the arid Great Plains. Ker does not give the desired information, but fortunately Nuttall himself, in his Genera of North American Plants, published in 1818, says, page 219: "In the spring of the year 1810 I discovered this plant near the confluence of Huron river [in the State of Ohio] and Lake Erie. I have since found

it abundantly in alluvial situations a few miles from St. Louis, Louisiana [that is, St. Louis, Missouri], and more recently very plentiful on the lowest banks of the Ohio." From this it is clear that Nuttall did not get his specimens on the upper Missouri in his journey of 1810 to a point near the Mandan Indian villages of North Dakota, and indeed the camas plant does not extend so far east. The possibility that Nuttall had sent to England living bulbs brought back from the Rocky Mountains by Lewis and Clark may be dismissed by the lack of any direct evidence to that effect, as well as by the facts that none of Lewis and Clark's plants are mentioned in Fraser's Catalogue, and that Pursh, who went over their specimens and from them described the camas plant, had not living specimens but only dried ones. The plants which Nuttall sent to Fraser probably came from the St. Louis, as opposed to either the Lake Erie or the lower Ohio localities, for Fraser's Catalogue contains several other plants labeled as coming from the vicinity of St. Louis; none from the other two places.

This identification of Ker's *Scilla esculenta* as the equivalent of *Camassia fraseri*, the plant of the upper Mississippi Valley region, not only is satisfactory on geographic and descriptive grounds, but it agrees with the identifications of Torrey* and Watson,† and with the doubts expressed by Ker,‡ Hooker,§ and Lindley‖ as to its identity with the northwestern plant. The name *Scilla esculenta* being, therefore, not available for the camas plant, the name given it by Pursh in 1814, *Phalangium quamash*, is the oldest.

In the matter of generic names these plants have been well supplied. Scilla is now considered a distinct genus, and Phalangium is a synonym of Anthericum. Various authors recognizing the camas plant as not congeneric with either of these have given it a new genus name, such as Sitocodium Salisb., Lemotris Raf., Bulbedulis Raf., and Camassia Lindl., but Dr. Britton has recently brought to light a name older than any of these, namely, Quamasia. This was published by Rafinesque in 1818 in the American Monthly Magazine, second volume, page

* Pac. R. Rep. **4**: 147. 1857.
† Proc. Am. Acad. **14**: 241. 1879.
‡ Bot. Mag. **38**: *t. 1574*. 1813.
§ Bot. Mag. **54**: *t. 2774*. 1827.
‖ Bot. Reg. **18**: *t. 1486*. 1832.

265. In this publication, which was a review of Pursh's Flora, Rafinesque renamed Pursh's *Phalangium quamash* as *Quamasia esculenta*, thus giving to the camas plant its first name as a distinct genus.

The generic name Cyanotris of Rafinesque has given botanists some trouble from its citation as an equivalent of Camassia. It appears that Rafinesque twice published this generic name, apparently using it each time in a different sense. His first publication of it was in 1818 (not 1811 as cited in the Index Kewensis), on page 356 of the third volume of the American Monthly Magazine, where he described under the name *Cyanotris scilloides* a plant which has been referred sometimes to the northwestern, sometimes to the eastern Camassia. On geographic grounds, however, it cannot be the northwestern plant, and if it is the eastern plant Rafinesque's brief description is not altogether correct, for the leaves are not oblong-lanceolate nor is the capsule trispermous. In the following year, on page 192 of the fourth volume of the same journal, Rafinesque again published the name Cyanotris, this time basing it upon Michaux's *Helonias angustifolia*, a plant which is referred by recent authors to Zygadenus.

The citation and synonymy of the genus Quamasia are as follows:

**Quamasia** Raf.

*Quamasia* Raf., Am. Month. Mag. **2**: 265. February, 1818.
*Cyanotris* Raf., Am. Month. Mag. **3**: 356. September, 1818. Not Cyanotris Raf. 1819.
*Lemotris* Raf., Fl. Tellur. **2**: 26. 1836.
*Bulbedulis* Raf., Fl. Tellur. **2**: 26. 1836.
*Camassia* Lindl., Bot. Reg. **18**: *t. 1486*. 1832.
*Sitocodium* Salisb., Gen. Pl. Fragm. 27. 1866.

A rough synopsis of the species, with the principal bibliographical references, may be useful to students who desire to make a critical study of the group.

* *Perianth more than 18 millimeters in length.*

† *Perianth nearly regular, its parts commonly connivent above the ovary when withering, 5 to 9-nerved, usually 7-nerved.*

**Quamasia leichtlinii** (Baker).

*Chlorogalum leichtlinii* Baker, Gard. Chron. new ser. **1**: 689. 1874.
*Camassia esculenta leichtlinii* Baker, Bot. Mag. **103**: *t. 6287*. 1877.
*Camassia leichtlinii* Wats. Proc. Am. Acad. **20**: 376. 1885.

A species with flowers from dark blue to white, the bulbs eaten by the aborigines. It apparently ranges from the Cascade Mountains of Washington and Oregon westward to the Pacific, northward to Vancouver Island, and southward along the coast to the vicinity of San Francisco. It was described from white-flowered specimens cultivated in Europe from material collected in British Columbia by John Jeffrey in 1851.

†† *Perianth clearly irregular, five of its parts ascending, the other deflexed, all of them 3 to 5-nerved, usually 3-nerved, seldom connivent above the ovary when withering.*

‡ *Stems few to several in a cluster, commonly 60 to 80 centimeters high; leaves usually 2 to 3.5 centimeters broad; capsules obtuse at the apex, much exceeded by their pedicels.*

**Quamasia cusickii** (Wats.).

*Camassia cusickii* Wats. Proc. Am. Acad. **22**: 479. 1887.

The largest species of the genus, its flowers pale blue. The species is known only from the original locality, "slopes of the Eagle Creek [also known as Wallowa and Powder River] Mountains, [north] eastern Oregon, at 4,000 to 6,000 feet altitude," where it grows "on hillsides instead of in wet meadows," while its bulb is "nauseous, pungent, and inedible."

‡‡ *Stems commonly single, usually 30 to 50 centimeters high; leaves seldom exceeding 2 centimeters in width; capsules broadly acute at the apex, equaling or exceeding their pedicels.*

**Quamasia quamash** (Pursh).

*Phalangium quamash* Pursh, Fl. Am. Sept. **1**: 226. 1814.
*Quamasia esculenta* Raf. Am. Month. Mag. **2**: 265. 1818.
*Anthericum esculentum* Spreng. Syst. Veg. **2**: 84. 1825.
*Camassia esculenta* Lindl. Bot. Reg. **18**: *t. 1486.* 1832.
*Camassia quamash* Greene, Man. Bay Reg. Bot. 313. 1894.

Flowers usually dark blue, varying occasionally to white. This is the original camas plant of Lewis and Clark, who brought from the headwaters of the Missouri, in western Montana, the specimens on which Pursh's description was based. It extends westward at least to the Cascade Mountains of Washington and Oregon, and the Sierra Nevada of northern California, reaching southward into northern Nevada and Utah. It grows typically in so-called camas meadows, where the basaltic soil is very soft and wet in spring, but exceedingly hard and dry later in the season. The bulbs are still an important food among the Indians in many localities.

** *Perianth less than 18 millimeters in length.*

† *Pedicels longer than the bracts; anthers about 3 millimeters in length.*

**Quamasia howellii** (Wats.).

*Camassia howellii* Wats. Proc. Am. Acad. **25**: 135. 1890.

Perianth described as pale purple, the capsules, about 6 millimeters in length, borne on pedicels three to four times as long. The species is known only from Grant's Pass, in southwestern Oregon.

†† *Pedicels shorter than the bracts; anthers about 2 millimeters or less in length.*

**Quamasia esculenta** (Ker).

*Phalangium esculentum* Nutt. in Fraser's Cat. 1813. Nomen nudum.

*Scilla esculenta* Ker, Bot. Mag. **38**: *t. 1554.* 1813.

*Phalangium esculentum* Nutt.; Ker, Bot. Mag. **38**: *t. 1574.* 1813. As synonym.

*? Cyanotris scilloides* Raf. Am. Month. Mag. **3**: 356. 1818.

*Lemotrys hyacinthina* Raf. Fl. Tellur. **3**: 51. 1836.

*Camassia fraseri* Torr. Pac. R. Rep. **2** [pt. 4]: 176. 1855.

*Scilla fraseri* Gray, Man. ed. 2. 469. 1856.

*Sitocodium esculentum* Salisb. Gen. Pl. Fragm. 27. 1866.

*Quamasia hyacinthina* Britton in Britton & Brown, Ill. Fl. **1**: 423. *fig. 1018.* 1896.

*Scilla angusta* Engelm. & Gray, Bost. Journ. Nat. Hist. **5**: 237. 1845.

*Camassia fraseri angusta* Torr. & Gr. Pac. R. Rep. **2** [pt. 4]: 176. 1855.

A plant with pale blue flowers, popularly known as the "wild hyacinth." It ranges almost throughout the Mississippi Valley, from western Pennsylvania to Wisconsin, Kansas, and southwestward to central Texas.

The two synonyms last cited belong to a narrow-leaved small-flowered plant (leaves seldom exceeding 6 millimeters in width, and perianth about 6 millimeters in length, as opposed to 8 to 12 millimeters and 10 millimeters respectively in the typical plant), originally collected by Lindheimer at New Braunfels, in central Texas, and said to extend to Louisiana and Missouri. Though considered a variety of this species by most authors, it merits critical study in the field, as, if the difference in time of flowering cited by the describers prove constant, it is probably a distinct species.

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PROCEEDINGS

OF THE

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# DESCRIPTION OF A NEW VOLE FROM OREGON.

BY GERRIT S. MILLER, Jr.

A small species of *Microtus* of the *nanus* group, represented by twelve specimens from the Willamette Valley, Oregon,* may be named and described as follows:

**Microtus canicaudus** sp. nov.

*Type* from McCoy, Oregon. Adult ♂, No. 75841, U. S. National Museum, Biological Survey collection. Collected December 1, 1895, by B. J. Bretherton. Original No. 2119.

*General characters.*—Size and proportions about as in *Microtus nanus* (Merriam), but color yellower and less grizzled, and tail usually nearly uniform grayish above and below; skull broader than in *M. nanus*, with rounder andital bullæ and differently shaped bony palate.

*Color.*—Head, back, and sides umber-brown thickly sprinkled with blackish hairs, the ground color darker on head and paler on sides, where it shades rather abruptly into color of belly; ventral surface grayish white, faintly marked with yellowish; fur everywhere deep plumbeous at base, this color showing through irregularly on belly and throat; tail whitish gray, slightly paler below and darker at tip.

The exact shade of brown varies, but it is always yellower than in *M. nanus*, and seldom shows any approach to the peculiar grizzled appearance characteristic of the latter. The tail occasionally has a tolerably well-defined dark dorsal stripe, but in the great majority of specimens (taken in March, April, October, November, and December) it is scarcely visible.

*Two from Beaverton (Nos. 371 and 372, Miller collection), and ten from McCoy (Nos. 75834–75842 and 75844, U. S. National Museum, Biological Survey collection), the latter kindly placed at my disposal by Dr. C. Hart Merriam.

*Skull.*—Fully grown skulls vary from 22.6 to 24.6 mm. in basilar length and from 14.6 to 15.6 in zygomatic breadth; brain case broader and deeper than in *M. nanus;* audital bullæ flatter and rounder; bony palate with excessively shallow lateral pits.

*Teeth.*—The enamel pattern, like that of the other members of the *nanus* group, is that of the typical or tetramerodont species of the subgenus *Microtus.*

*Measurements.*—Type specimen: total length, 135; tail vertebræ, 33; hind foot, 20. Average of eight adult topotypes: total length, 141; tail vertebræ, 35.7; hind foot, 20. (All measurements from fresh specimens by collector.)

*General remarks.*—*Microtus nanus, M. canicaudus,* and *M. mogollonensis* form a group of closely related species which in size, general appearance, and cranial and dental characters differ noticeably from other American members of the genus, but strikingly resemble the European *Microtus arvalis.* So close is this resemblance that it is possible to select skulls of *M. mogollonensis* (the smallest member of the group) from San Francisco Mountain, Arizona, that are practically indistinguishable from skulls of *M. arvalis* taken in Slavonia. The only constant cranial characters to distinguish the skulls of these two species appear to be the slightly broader rostrum, more flaring zygomata, and wider, less squarely truncate interpterygoid fossa of *mogollonensis.* Externally the resemblance is no less close, for *M. arvalis* has the same short tail and small hind foot as the American species, while in color it differs only in a somewhat yellower cast.

The three American species are distinguished from each other by the following characters:

*M. mogollonensis* (Mearns).—Total length, 132.2; tail vertebræ, 28.3; hind foot, 18 (average of eight adults); general color grizzled yellowish brown; tail indistinctly bicolor; basilar length of skull about 21 millimeters; nasal branches of premaxillaries considerably extended back of nasals; audital bullæ roundish; bony palate with lateral pits very deep.

*M. nanus* (Merriam).—Total length, 140; tail vertebræ, 37.7; hind foot, 18.9 (average of nine adults); general color grizzled grayish brown; tail distinctly bicolor; basilar length of skull about 23 millimeters; nasal branches of premaxillaries slightly extended back of nasals; audital bullæ subfusiform; palate with lateral pits moderate.

*M. canicaudus* Miller.—Total length, 141; tail vertebræ, 35.7; hind foot, 20 (average of eight adults); general color uniform umber-brown; tail indistinctly bicolor; basilar length of skull about 23 millimeters; nasal branches of premaxillaries scarcely extended back of nasals; audital bullæ roundish; palate with lateral pits very shallow.

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# A SPECIES OF SHEARWATER (*PUFFINUS ASSIMILIS* GOULD), NEW TO THE NORTH AMERICAN FAUNA.

BY JONATHAN DWIGHT, JR., M. D.

A specimen of a strange Shearwater was sent to me some time ago by Mr. R. J. Boutilier from Sable Island, Nova Scotia, where it struck the west end light-house on September 1, 1896. It was submitted to Mr. Robert Ridgway, Dr. J. A. Allen, and Mr. William Brewster for examination, all of whom, in the absence of any material for comparison, naturally hesitated to express positive opinions as to its identity. There can be little doubt, however, that it is referable to the Allied Shearwater (*Puffinus assimilis*), a species described by Gould,* from New South Wales, Australia, and found by later observers at several other points in the South Pacific Ocean. There are no specimens apparently in North American museums. It appears to be the smallest of the Shearwaters, in spite of certain discrepancies in the measurements of several writers. The dimensions as given originally by Gould differ considerably from those recently published by Salvin,† and those of my bird come nearly midway between the two, except that the bill of my bird is shorter than the bills described. Gould's statement that $2\frac{3}{8}$ inches is the length of bill is surely a misprint. In color my specimen corresponds exactly with the descriptions of *P. assimilis*, especially the upper parts "slaty-black rather bluer than *P. obscurus*," which species, besides being larger, differs in having dusky under tail

*Proc. Zoöl. Soc., 1837, p. 156.

†Cat. Birds, British Mus., vol. XXV, 1896, p. 384.

coverts. It corresponds, too, with Gould's colored plate (Birds of Australia, vol. VII, 1848, pl. 59). Salvin considers *P. audubóni* a synonym of *P. obscurus*, and *P. subalaris* also has dusky under tail coverts. Another small species has been described, *P. elegans*, but the feathers of the back of this bird are edged with white. These are the only species to which my specimen is very closely related. It shows evidences of moult, for many of the body feathers are just sprouting, and several of the rectrices are barely out of their sheaths. It may be described as follows:

**Puffinus assimilis.**

Entire upper parts, including head, nape, back, wings, tail coverts, and tail, bluish slate black, the greater wing coverts obscurely tipped with white; entire lower parts, including under wing coverts, axillaries, and under tail coverts, pure white. The black and white blend along a fairly definite line, passing through the lores and eye and down the sides of the neck, losing itself beneath the folded wing. The coverts of the outer edge of the wing beneath and the outermost of the under tail coverts are faintly dusky. The primaries beneath are dingy white along the inner webs nearly to the apices. Bill, in dried specimen, slate black. Tarsi and feet brownish black, webs between the toes yellowish.

Length in inches, about 11; wing, 6.80; middle rectrix, 2.90; tarsus, 1.36; middle toe, 1.38; middle toe with claw, 1.64; bill, culmen, 0.97; gape, 1.35; from nostril, 0.70; depth at nostril, 0.17; width at nostril, 0.17; unguis, 0.47.

The capture of the Allied Shearwater at Sable Island simply extends the range of a pelagic species, one of a large family of ocean wanderers. It has strayed several times to the Madeira Islands, but its natural habitat is the South Pacific Ocean, in the vicinity of New Zealand and Australia. Its occurrence at Sable Island is of course purely accidental and constitutes the first and only record for North America.

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PROCEEDINGS

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# DESCRIPTIONS OF TWO NEW RED BACKED MICE (*EVOTOMYS*) FROM OREGON.

BY C. HART MERRIAM.

The field parties of the U. S. Biological Survey, while at work in the southern part of the Cascade Range in Oregon last summer, obtained two undescribed species of *Evotomys*. The first of these was found in the Hudsonian zone at Crater Lake, on top of Mt. Mazama; the other in the Transition zone of the Rogue River Valley at Prospect, at the west base of Mt. Mazama.

The Crater Lake animal, named *E. mazama* after the mountain on whose summit Crater Lake is situated, is an alpine species and seems to be very distinct from any heretofore described. It was also found by us on Mt. Hood. The affinities of the Rogue River animal seem to be in the direction of *E. californicus*.

The new species may be known from the following descriptions:

**Evotomys mazama** sp. nov.

*Type* from Crater Lake, south end of Cascade Range, Oregon. No. 79913, ♂ ad., U. S. Nat. Mus., Biological Survey collection. Altitude 7000 feet [2130 meters]. Collected August 15, 1896, by C. Hart Merriam and Vernon Bailey. Original No. 5765.

*General characters.*—Size rather large; tail long for an *Evotomys;* ears medium or rather short; coloration rather pale; dorsal area relatively pale and not well defined.

*Color.*—Sides of head and body, and head from nose to forehead, pale gray or grayish ash; dorsal area pale dull chestnut, varying to pale rusty; under parts buffy white, the plumbeous under fur showing through;

tail bicolor, with sharp line of demarkation; upper side dusky, under side white; fore and hind feet white.

*Cranial characters.*—Skull large, rostrum long, especially as seen from below; braincase large and strongly subquadrate, flattened above; zygomata strongly spreading, the anterior root standing out rather abruptly from rostrum; audital bullæ large and strongly inflated; incisive foramina very long; enamel loops of molar teeth not crowded; those of last upper molar more irregular than usual.

*Remarks.*—Contrasted with *Evotomys obscurus* from the west base of Mt. Mazama, *E. mazama* may be distinguished by its much paler coloration, longer tail, and by the dimness or absence of the dusky patch on the foreleg just above the ankle. The skull differs from that of *obscurus* in the much greater length of the rostrum and incisive foramina. The crowns of the molar teeth are longer, and the loops less crowded.

*Measurements.*—Type specimen, ♂ adult: total length, 160; tail vertebræ, 54; hind foot, 19. Average of four adult ♂ from type locality: total length, 157; tail vertebræ, 52; hind foot, 18.75.

### **Evotomys obscurus** sp. nov.

*Type* from Prospect, Upper Rogue River Valley, Oregon (at west base of Mount Mazama, altitude about 2600 feet or 800 meters). Type No. 80413, ♂ ad., U. S. Nat. Mus., Biological Survey collection. Collected August 29, 1896, by Edward A. Preble. Original No. 1455.

*General characters.*—Size rather large, tail medium; coloration dark; dorsal area dull and ill defined.

*Color.*—Sides of head and body and head from nose to forehead dark gray or grayish bister; dorsal area very dull umber brown, passing gradually into color of sides; under parts buffy white, the plumbeous basal fur showing through; tail sharply bicolor, dusky above, whitish beneath; fore and hind feet soiled white; ankle and foreleg from elbow to wrist dusky.

*Cranial characters.*—Skull short, particularly the rostrum; braincase subquadrate and moderately flattened, but less flattened than in *E. mazama;* zygomata bowed well outward, the anterior base standing square out from rostrum; audital bullæ large; crowns of molar teeth short, the loops crowded; incisive foramina short.

*Remarks.*—*Evotomys obscurus* is very much darker than *E. mazama*, and has a decidedly shorter tail. In general form the skull resembles that of *E. mazama*, but it is slightly smaller, the rostrum and incisive foramina are decidedly shorter, and the braincase is less flattened. The crowns of the molar teeth are shorter, and the enamel loops much more crowded. Externally the animal resembles *Evotomys occidentalis* from the Puget Sound country. The skull, however, differs strikingly from that of *occidentalis*, the latter being narrow and smoothly rounded like a small *Peromyscus*. Probably *E. obscurus* is more nearly related to *E. californicus* of the northwest coast region of California than to any other species.

*Measurements.*—Type specimen: total length, 155; tail vertebræ, 47; hind foot, 17. Average of three specimens from type locality: total length, 148; tail vertebræ, 46; hind foot, 17.

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MARINE BIOLOGICAL LABORATORY LIBRARY

# THE VOLES OF THE SUBGENUS *CHILOTUS*, WITH DESCRIPTIONS OF NEW SPECIES.

BY C. HART MERRIAM.

Heretofore only a single species of Baird's subgenus *Chilotus* has been recognized—the '*Arvicola oregoni*' of Bachman, which inhabits the coast region of Oregon.

While making a Biological survey of the Crater Lake region, in the southern part of the Cascade Range in Oregon, last August, Mr. Vernon Bailey and I secured a new member of the group. It is apparently an alpine species and differs strikingly from *M. oregoni* in much paler coloration and shorter tail. A third form, also having a short tail, but much darker than either *oregoni* or the Crater Lake species, was obtained by Mr. Streator at Agassiz, in British Columbia. The three forms constitute a very compact group (subgenus *Chilotus* Baird), differing from all the other Voles in a combination of characters which have been so recently summarized by Mr. Gerrit S. Miller, Jr., in his admirable paper on *The Genera of Voles and Lemmings** that it is unnecessary to repeat them here. The subgenus is restricted to the northwest coast region, where it ranges from the northwestern corner of California (Crescent City) to southern British Columbia (Port Moody and Agassiz). The extreme northern and southern limits of its range have not been determined. *M. bairdi* is clearly a mountain animal, confined to the Cascade Range, but the data at present available are not sufficient to admit of mapping the distinctive ranges of *oregoni* and *serpens*.

* North Am. Fauna, No. 12, pp. 60–62, July, 1896.

The three species here recognized agree almost exactly in size, the only difference being that the tail of *oregoni* is about 10 millimeters longer than that of either of the others. In color *oregoni* holds an intermediate position, *bairdi* being the palest and *serpens* the darkest of the three.

Following are descriptions of the known species:

### Microtus oregoni (Bachman.)

*Arvicola oregoni* Bachman, Journ. Acad. Nat. Sci., Phila., VIII, pt. 1, 60–61, 1839.

*Type locality.*—Astoria, Oregon.

*General characters.*—Size rather small; pelage short and coarse with a decided 'pepper and salt' appearance; tail longer and ears more prominent than in the other members of the subgenus.

*Color.*—Upper parts brownish bister; under parts dark, more or less washed with buffy; tail blackish above, paler below.

*Cranial characters.*—Compared with the other known members of the subgenus (*bairdi* and *serpens*) the braincase is narrower, less flattened, and less subquadrate, the interparietal larger and more squarely rectangular, the zygomata more strongly bowed outward, the frontal more distinctly grooved interorbitally, and the ascending arms of the premaxillæ longer.

*Measurements.*—An adult ♂ from type locality: total length, 140; tail vertebræ, 42; hind foot, 17.

### Microtus bairdi sp. nov.

*Type* from Glacier Peak, Crater Lake, Oregon (altitude about 7800 feet, or 2350 meters). No. 79906, ♀ ad., U. S. Nat. Mus., Biological Survey collection. Collected August 24, 1896, by C. Hart Merriam and Vernon Bailey. Original No. 5813.

*General characters.*—Size small, a little smaller than *M. oregoni;* ears and tail rather short; coloration pale.

*Color.*—Upper parts uniform rather pale grayish bister, with a faint reddish brown cast, and glossy; under parts whitish, the plumbeous basal fur showing through; tail bicolor; dark above, whitish beneath; feet soiled whitish; nose dusky.

*Cranial characters.*—Skull rather small and flat; braincase subquadrate (broad in type specimen); zygomata bowed well outward; rostrum short; audital bullæ large and well rounded; incisive foramina short, not reaching nearly to incisors. Compared with *M. oregoni* the rostrum as seen from above is much shorter.

The dental characters are those of the subgenus *Chilotus.*

*Remarks.*—This interesting new Vole may be distinguished at a glance from *M. oregoni* by its shorter ears and tail and very much paler color. I have named it in honor of Professor Baird, who first recognized and named the subgenus.

*Measurements.*—Type specimen (♀ adult): total length, 131; tail vertebræ, 33; hind foot, 17.5. A young adult ♂ from type locality: total length, 130; tail vertebræ, 32; hind foot, 17.

### **Microtus serpens** sp. nov.

*Type* from Agassiz, British Columbia. No. 76303, ♂ ad., U. S. Nat. Mus., Biological Survey collection. Collected December 2, 1895, by Clark P. Streator. Original No. 5068.

*General characters.*—Similar to *M. oregoni*, but tail much shorter; color darker; pelage much softer and longer (10 mm. or more on back in winter specimens); ears buried in the long fur.

*Color.*—Upper parts very dark brown, becoming almost dusky on posterior half of back, and everywhere profusely mixed with black-tipped hairs: under parts dark plumbeous, the belly washed with ashy or buffy; tail dusky above, pale below, and faintly edged and tipped with whitish when seen from above (due to the projection of the whitish hairs of the under side).

*Cranial characters.*—Skull similar to that of *M. oregoni*, but slightly larger; interorbital region less 'pinched in;' interparietal tapering off more gradually on each side; teeth larger; crowns of molar series longer.

*Measurements.*—Type specimen: total length, 130; tail vertebræ, 31; hind foot, 18. Average of seven specimens from type locality: total length, 130; tail vertebræ, 32; hind foot, 17.5.

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PROCEEDINGS

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# SYNOPSIS OF THE VOLES OF THE GENUS *PHENACOMYS*.

BY GERRIT S. MILLER, JR.

With the possible exception of some bones and teeth found in a cave in southern Hungary and described by Nehring in 1883, no specimens of voles of the genus *Phenacomys* were brought to notice until about eight years ago. In October, 1889, Dr. C. Hart Merriam first defined the genus and described four specimens, two from Labrador, one from Quebec, and one from British Columbia, each of which he made the type of a new species. In 1890 Mr. F. W. True described a fifth species from Oregon. A year later Dr. Merriam discovered still another in Idaho. In 1894 Dr. J. A. Allen described a seventh form supposed to be from the Black Hills of South Dakota. During the following year Mr. S. N. Rhoads named an eighth from British Columbia. Finally, Dr. Merriam has recently described a ninth species from Colorado. In addition to these descriptions of new species, several minor references to the genus have been published. Of these the most important is that by Nehring, in which the remains from the cave in southern Hungary, already referred to, are determined as those of *Phenacomys*.*

As might be inferred from this summary, the material by which the genus is represented in collections has greatly increased since the first specimens were described. Now there are not far from

* Full references to all these papers are given in the bibliography at the end of this article.

one hundred well-prepared skins available for examination.* This material shows that, of the nine described forms, the following six are valid:

| *Name.* | *Type locality.* |
|---|---|
| *P. intermedius* Merriam | Kamloops, British Columbia. |
| *P. orophilus* Merriam | Salmon River Mountains, Idaho. |
| *P. preblei* Merriam | Longs Peak, Colorado. |
| *P. latimanus* Merriam | Fort Chimo, Ungava, Labrador. |
| *P. ungava* Merriam | Fort Chimo, Ungava, Labrador. |
| *P. longicaudus* True | Marshfield, Coos County, Oregon. |

These fall naturally into three groups, each of which occupies a different geographic region. The *ungava* group, containing two well-marked yellow-faced species, *ungava* and *latimanus*, ranges from Quebec and Labrador west at least as far as the north shore of Lake Superior. The *intermedius* group, with three slightly differentiated uniformly grayish or ochraceous species, *intermedius*, *orophilus*, and *preblei*, occupies the mountains of British Columbia, Alberta, and the northwestern United States. The third or *longicaudus* group is represented by one species only, the very aberrant *P. longicaudus* of the humid coast district of Oregon.

The species of *Phenacomys* are voles of medium or small size. With the exception of *P. longicaudus*, which is remarkable for its very long tail, there is nothing in the external appearance of any to distinguish them from small species of *Microtus*. They generally inhabit dry, grassy plains and mountain parks, but *P. longicaudus* appears to be strictly arboreal. At present all the species definitely known are American. The determination of the European fossil remains is open to question.†

*The specimens examined in the present connection are distributed as follows: U. S. National Museum, 64, including the types of *P. longicaudus*, *P. orophilus*, *P. truei*, and *P. preblei* (all but two of these are in the Biological Survey collection); Museum of the Canadian Geological and Natural History Survey, 1 (type of *P. intermedius*); Merriam collection, 3 (types of *P. celatus*, *P. ungava*, and *P. latimanus*); Bangs collection, 16 *P. ungava* from Hamilton Inlet, Labrador; Miller collection, 7 *P. latimanus* from the north shore of Lake Superior, and 4 *P. orophilus* from Mount Baker, British Columbia (topotypes of *P. oramontis*).

†See North American Fauna, No. 12, p. 40.

## Genus PHENACOMYS Merriam.

*Phenacomys* Merriam, North American Fauna, No. 2, p. 28, October 30, 1889.

*Type species.*—*Phenacomys intermedius* Merriam.

*Geographic distribution.*—Boreal North America from Atlantic to Pacific, south to the Gulf of Saint Lawrence, the north shore of Lake Superior, the coast of Oregon, and in the Rocky Mountains to Colorado.

*Generic characters.*—Skull and teeth in general as in *Microtus*, but molars distinctly two-rooted in the adult, and root of lower incisor never reaching level of dental foramen. Reëntrant angles on inner side of lower molars very much deeper than those of outer side, not approximately equal to outer angles as in *Microtus* and *Erotomys*.

*Remarks.*—*Phenacomys* combines the palate, heavily built angular skull, and strong sharply angled teeth of *Microtus* with the rooted molars and short lower incisors of *Erotomys*. It differs from both *Microtus* and *Erotomys* in the relatively great depth of the inner reëntrant angles of the mandibular molars.

### Key to the Species of Phenacomys.

Tail about 40 percent of total length..... ..*longicaudus*.
Tail about 25 percent of total length.
  Face and muzzle reddish or yellowish in strong contrast with rest of head.
    Skull of adult with deep frontal sulcus .....*ungava*.
    Skull of adult without frontal sulcus. .....*latimanus*.
  Face and muzzle essentially same color as rest of head.
    Ascending branches of premaxillæ broad.....*intermedius*.
    Ascending branches of premaxillæ narrow.
      Color decidedly ochraceous.....*preblei*.
      Color gray..... ...*orophilus*.

### **Phenacomys intermedius** Merriam.

*Phenacomys intermedius* Merriam, North American Fauna, No. 2, p. 32, October 30, 1889.

*Type locality.*—Basaltic plateau about 20 miles NNW. of Kamloops, British Columbia. Altitude 5,500 feet. Type No. 780, Mus. Geol. and Nat Hist. Surv. Canada. Collected by Dr. Geo. M. Dawson.

*Geographic distribution.*—*Phenacomys intermedius* is known from the type locality only.

*General characters.*—Size small; general color pale; feet light brown; skull with interorbital region and ascending branches of premaxillæ very broad; front lower molar with five well developed salient angles on outer side.

*Color.*—Back grizzled grayish brown with a yellowish tinge, everywhere sprinkled with black-tipped hairs which are most numerous on middle of

back and over lumbar region; belly grayish white, the deep plumbeous bases of the hairs showing through; tail sharply bicolor, nearly black above, white beneath; feet light brownish; whiskers mixed blackish and silvery gray.

*Skull.*—The skull of the type and only known specimen of *Phenacomys intermedius* is so badly broken that many of its characters cannot be ascertained. Enough remains to show two peculiarities which are not shared by any of the numerous skulls of *P. orophilus* with which I have compared it. These are the great breadth of the interorbital region (4 mm. at narrowest part of constriction) and the expanded terminations of the ascending branches of the premaxillæ. The latter character is approached in the type specimen of *P. preblei*. The rostrum appears slightly shorter and deeper than in *P. orophilus*, but this is probably only an optical effect due to the imperfect condition of the nasal bones.

*Teeth.*—The enamel pattern is essentially the same as that of *P. orophilus*, except that the anterior loop of the front lower molar is so deeply cut by reëntrant angles that a third outer triangle is wholly isolated and a fourth inner triangle is nearly cut off. As a result the transverse loop is reduced to a narrow crescent placed obliquely with the convexity directed forward and outward.

*Measurements.*—"Total length, about 118; tail vertebræ, 28; hind foot, 18; ear from anterior root, 13 (from dry skin)"—Merriam.

*General remarks.*—The type specimen of *Phenacomys intermedius*, although imperfect, shows too many differences from any of the other described forms to be united with them. The breadth of the interorbital region is a character of trifling importance, and one which might easily disappear with increasing age, but the great expansion of the ascending branches of the premaxillæ is scarcely to be explained in this way. The peculiarities of the front lower molar are not of a kind likely to be the result of immaturity, and if they are purely individual they represent a degree of variability far in excess of that presented by other known species of the genus. As the skin is now sealed between two glass plates, it is not possible to determine with certainty the character of the fur, but it appears to be less dense and woolly than in *P. orophilus*. In color the type shows no distinct differences from *P. orophilus*, except that the feet are light brown instead of white.

### Phenacomys orophilus Merriam.

*Phenacomys orophilus* Merriam, North American Fauna, No. 5, p. 65, July 30, 1891.

*Phenacomys truei* Allen, Bull. Am. Mus. Nat. Hist., VI, p. 331, November 7, 1894.

*Phenacomys oramontis* Rhoads, American Naturalist, XXIX, p. 941, October, 1895.

*Type locality.*—Salmon River Mountains, Idaho (near head of Timber Creek; altitude, 10,500 feet). Type in U. S. National Museum (♀ adult, No. $\frac{23856}{31256}$).

*Geographic distribution.*—Hudsonian zone and parts of Canadian zone,

in the mountains of Alberta, British Columbia, and the western United States south to southern Wyoming, central Idaho, and south central Oregon.

*General characters.*—Size small; fur dense and woolly; general color light gray, somewhat tinged with yellowish; feet nearly white; interorbital region of skull narrow and smooth; ascending branches of premaxillæ narrow.

*Color.*—Back grizzled grayish brown, with a yellowish tinge, which is most distinct in spring and summer specimens, the fur everywhere thickly sprinkled with blackish hairs, which, however, do not form a distinct dark dorsal area; face with very few blackish hairs, but not yellower than back; belly dirty white; feet silvery whitish; tail sharply bicolor, pure white below, mixed brown and white above; under fur dark plumbeous, this color showing through irregularly on belly and throat. The young are clearer gray than the adults, but otherwise similar.

*Skull.*—The skull of *Phenacomys orophilus* is of medium size, that of the type measuring 23.1 mm. in basilar length and 14.2 mm. in zygomatic breadth. The interorbital constriction is narrow, and the frontal ridges, even in very old skulls, are too slightly developed to form a frontal sulcus; ascending branches of premaxillaries narrow and scarcely expanded posteriorly; jugal broadly expanded and mortised into zygomatic process of maxillary.

*Teeth.*—The enamel pattern shows no distinctive characters as compared with the species of the *ungava* group. The anterior loop of the front lower molar is unusually variable in form, but in the majority of specimens is similar to that of *P. latimanus*.

*Measurements.*—Type specimen: total length, 146; tail vertebræ, 38; hind foot, 19; average of eight adults from Bear Tooth Mountains, Montana: total length, 146.5; tail vertebræ, 31.8; hind foot, 17.7; average of ten adults from St. Marys Lake, Montana: total length, 141.7; tail vertebræ, 34.5; hind foot, 17.7; average of three adults from type locality of *P. oramontis:* total length, 144.6; tail vertebræ, 37.5; hind foot, 19.3.

*Specimens examined.*—Total number, 56.

*Wyoming:* Near Laramie, 1 (type of *P. truei*); Tower Falls, Yellowstone Park, 1.

*Montana:* Bear Tooth Mountains, 23; Big Snowy Mountains, 1; Midvale, 1; St. Marys Lake, 12; Summit, 1.

*Idaho:* Salmon River Mountains, 4; Sawtooth City, 2.

*Oregon:* Blue Mountains (10 miles north of Harney), 1; Crater Lake, 2; Diamond Lake, 1; Mount Hood, 1.

*British Columbia:* Mount Baker Range, 4 (topotypes of *P. orophilus*).

*Alberta:* Ninety miles north of Jasper House, 1.

*General remarks.*—*Phenacomys orophilus* is distinguishable from all other species except *P. intermedius* by its combination of short tail, gray face, and pale color. From *P. intermedius* it differs in cranial and dental characters.

The range of this species is not continuous, but is interrupted wherever the mountains are not high enough to be capped by a Hudsonian area of

sufficient extent. As might be expected, members of the various colonies differ from each other. These differences are, however, too slight to be worthy of recognition by name. The most northerly specimen that I have seen, a female collected at Fishing Lake, Alberta, on September 17, 1896 (No. 81477, U. S. National Museum, Biological Survey collection), has the fur much less thick and woolly than in typical *orophilus*. The feet are brownish as in *P. intermedius*, but in all other characters it agrees perfectly with *orophilus*. Specimens from St. Marys Lake, Montana, average a trifle smaller than those from the type locality.

Since *Phenacomys orophilus* was first described it has received two additional names. The first of these, *P. truei* Allen, was based on the distorted skin and fragmentary skull of a young animal supposed to have been taken in the Black Hills of South Dakota, a region so isolated that if inhabited by the genus it would be expected to furnish a species different from those occurring farther west. The type specimen is, however, exactly like immature *orophilus* in color and in enamel pattern. In size it agrees perfectly except that the tail, in its present condition (a few of the proximal vertebræ removed, the rest dried in the skin), is about 7 millimeters shorter than in fresh specimens of the same age. No weight can be attached to this one difference in the absence of all others. Furthermore, it is practically certain that the type was not collected in the Black Hills of South Dakota, but in the Black Hills of Wyoming, now known as the Laramie Mountains. It was taken on August 10, 1857, by Dr. Hammond, a member of the expedition commanded by Lieut. F. T. Bryan. I have not been able to find any account of the Bryan expedition of 1857 further than the statement, on page 91 of the eleventh volume of the Pacific Railroad Reports, that "the wagon-road expedition under Lieutenant Bryan this year [1857] was confined to routes which he had previously mapped and explored." The map of Bryan's routes shows that he never entered the region now known as the Black Hills, but that his course followed up the Platte River and Lodge Pole Creek through the Laramie Mountains. It is therefore almost beyond doubt that the type of *Phenacomys truei* was collected in Albany County or Laramie County, Wyoming, a few miles northeast of the present town of Laramie. This region is almost continuous with the mountains included in the known range of *orophilus*. *Phenacomys oramontis* Rhoads was based on a specimen from the Mount Baker range in British Columbia, just north of the United States boundary. Four topotypes in my collection are indistinguishable from *P. orophilus*.

### Phenacomys preblei Merriam.

*Phenacomys preblei* Merriam, Proc. Biol. Soc. Washington, X, p. 45, March 16, 1897.

*Type locality.*—Longs Peak, Colorado. Type in U. S. National Museum (♂ adult, No. 74513), Biological Survey collection.

*Geographic distribution.*—*Phenacomys preblei* is at present known from the type locality only.

*General characters.*—Most like *P. orophilus*, but color much more ochraceous and ascending branches of premaxillæ more expanded terminally.

*Color.*—Dorsal surface clay color suffused with ochraceous, the back thickly sprinkled with black-tipped hairs; feet dirty white; belly yellowish white, the plumbeous under fur showing through irregularly; tail indistinctly bicolor, brownish above, whitish below.

*Skull.*—The skull is similar to that of *P. orophilus*, but the interorbital ridges are slightly more developed (though not enough to form a median sulcus), the terminal portion of the ascending branch of the premaxilla is broader and the jugal is scarcely mortised into the zygomatic arm of the maxillary.

*Teeth.*—Not appreciably different from those of *P. orophilus*.

*Specimens examined.*—One, the type.

*General remarks.*—*Phenacomys preblei* is closely related to *P. orophilus*, from which it differs in yellower color and some slight cranial characters. In one of the latter it approaches *P. intermedius*.

### Phenacomys latimanus Merriam.

*Phenacomys latimanus* Merriam, North American Fauna No. 2, p. 34, October 30, 1889.

*Type locality.*—Fort Chimo, Ungava, Labrador.

*Geographic distribution.*—Arctic and Hudsonian zones from northwestern Labrador to the north shore of Lake Superior. Limits of range not known.

*General characters.*—Size small; skull never developing sharply defined interorbital ridges, even in extreme old age; muzzle and face conspicuously yellower than rest of head.

*Color.*—Dorsal surface pale yellowish cinnamon-brown, clearer and more tinged with reddish on muzzle and face; region from eyes to base of tail strongly shaded with blackish hairs; feet and whole ventral surface whitish gray, the throat and belly somewhat darkened by the plumbeous bases of the hairs; no distinct line of demarkation on sides, but color of belly shading abruptly into that of back; tail sharply bicolor, dark brown above, whitish below; ears concolor with surrounding parts, but region immediately behind ear generally paler.

*Skull.*—The skulls of adult specimens vary in basal length from 20 to 22 mm., and in zygomatic breadth from 13 to 14 mm.; rostrum moderate (nasals contained about three and one-half times in occipito-nasal length) rather more lightly built than in *P. ungava*, and with profile usually more deflected from dorsal outline of frontals; interorbital region faintly concave, never distinctly sulcate.

*Teeth.*—The enamel pattern of this species calls for no special remark. The anterior loop of the front lower molar is usually cut on the inner side by a deep reëntrant angle, which is so much deeper than that on the outer side as to destroy the bilateral symmetry of the loop. This character occurs in other species, notably *P. orophilus*, but it appears to be more constant in *P. latimanus* than any other.

*Measurements.*—Type specimen "(from alcoholic before skinning): total length, 116; tail vertebræ, 28; hind foot, 18" (Merriam); seven adults from Peninsula Harbor, Ontario (north shore of Lake Superior), average: total length, 134; tail vertebræ, 29.9; hind foot, 18.1; maximum: total length, 150; tail vertebræ, 38; hind foot, 19.

*General remarks.*—*Phenacomys latimanus* is recognizable as a member of the *ungava* group by its distinctly fulvous face. From *P. ungava* it differs in its smaller size and smooth interorbital region.

### Phenacomys ungava Merriam.*

*Phenacomys celatus* Merriam, North American Fauna, No. 2, p. 33, October 30, 1889. Godbout, Province of Quebec, Canada (based on old skull, with subquadrate interparietal).

*Phenacomys ungava* Merriam, North American Fauna, No. 2, p. 35, October 30, 1889. Fort Chimo, Ungava, Labrador (based on young adult skull, with transversely lengthened interparietal).

*Type locality.*—Fort Chimo, Ungava, Labrador. Type in Merriam collection (♂ adult, No. $\frac{5468}{61355}$).

*Geographic distribution.*—Labrador and eastern Quebec. Not known from any point south of the lower edge of the Hudsonian zone.

*General characters.*—Size large; skull of adult with high interorbital ridges limiting a deep frontal sulcus; muzzle and face conspicuously yellower than rest of head.

*Color.*—Essentially as in *P. latimanus;* young darker and more plumbeous, at first without the cinnamon of the adult; tail of young specimens nearly uniform dusky, only slightly paler below.

*Skull.*—The skulls of adult specimens vary in basilar length from 22 to 25 mm. and in zygomatic breadth from 14 to 16 mm. Rostrum rather more heavily built than in *P. latimanus* and with profile usually less deflected from dorsal outline of frontals; interorbital region with two strongly developed ridges, between which lies a conspicuous trough which increases in depth and narrowness in old age

*Teeth.*—Except for their larger size, the teeth of *P. ungava* do not differ in any constant character from those of *P. latimanus.* The anterior loop of the front lower molar is, however, less frequently cut by a deep re-entrant angle on the inner side.

*Measurements.*—Type of *P. ungava* "(from alcoholic specimen before

* I am aware that in the original paper on the genus the specific name *ungava* is printed two pages beyond the name *celatus.* To assume, however, that of alternative names the one which stands first in a book has by virtue of mere position precedence over others is as unreasonable as to assume that the first species mentioned under a composite genus should, other things being equal, necessarily become the type. As priority dates from publication, and publication is distribution, it is impossible for one name to have priority over another issued with it; hence to displace the name *ungava* as here used it will be necessary to show that the animal has an older name, that is, one published prior to October 30, 1889.

skinning): total length, 138; tail vertebræ, 31; hind foot, 19" (Merriam). Type of *P. celatus* "(from alcoholic specimen before skinning): total length about 130; tail vertebræ, 32; hind foot, 17.5" (Merriam). In adult male from Godbout, Quebec (topotype of *celatus*), in alcohol: total length, 137; tail vertebræ, 32; hind foot, 18. Ten adults from Hamilton Inlet, Labrador: average, total length, 151; tail vertebræ, 37; hind foot, 20; maximum, total length, 160; tail vertebræ, 44; hind foot, 21.

*Specimens examined.*—Total number, 19.

*Labrador:* Fort Chimo, Ungava, 1 (type); Hamilton Inlet, 16; Groswater Bay, 2 (skulls).

*Quebec:* Godbout 4 (including type of *celatus*).

*General remarks.*—*Phenacomys ungava* is distinguished from *P. latimanus*, the only other known species with yellowish face, by its larger size and strongly ridged interorbital region. The specimens from Hamilton Inlet average considerably larger than the type of *P. ungava* or the two adults from Godbout, Quebec, but as they agree in all other characters it seems unwise to separate them on the basis of the material now at hand. This series shows individual variation sufficient to cover the supposed differences between *P. ungava* and *P. celatus*.

### **Phenacomys longicaudus** True.

*Phenacomys longicaudus* True, Proc. U. S. National Museum, XIII, p. 303, November 15, 1890.

*Type locality.*—Marshfield, Coos County, Oregon. Type in U. S. National Museum (young adult No. $\frac{19071}{25883}$).

*Geographic distribution.*—The species is at present known from two specimens only, the type and one from Meadows, Lane County, Oregon. It probably ranges throughout the densely forested coast district of Oregon.

*General characters.*—Size large; tail about 40 percent of total length; color rusty brown or drab.

*Color.*—Type (taken in August, 1890); head, back, and sides rusty brown, slightly duller along middle of back, the fur everywhere dark plumbeous at base and sprinkled with long blackish hairs, which, however, are not noticeable except on close examination; ventral surface rusty white, the plumbeous bases of the hairs showing through irregularly; tail unicolor, dark brown both above and below; feet dusky. The Lane County specimen (♀ No. $\frac{50649}{42621}$, U. S. National Museum, Biological Survey collection), taken on April 13, 1891, is wholly unlike the type in color. Head, back, and sides pale yellowish drab, the fur light bluish plumbeous at base and sprinkled with inconspicuous dark hairs; belly grayish white, the bluish bases of the hairs showing through irregularly; tail indistinctly bicolor, light slaty gray above and at tip, whitish mixed with gray below; feet silvery white.

*Skull.*—The skull of the type is in fragments, and that of the Lane County specimen cannot now be found, hence the cranial characters of *Phenacomys longicaudus* are at present unknown.

*Teeth.*—The teeth of *Phenacomys longicaudus* differ from those of the other species in the reduction in width of the inner triangles of the upper molars. This tendency is especially marked in the posterior inner triangles of the first and second teeth. In these the anterior face of the prism is nearly parallel with the anterior side of the second external reëntrant angle. The anterior transverse loop of the posterior upper molar is narrower than in other members of the genus and the terminal loop of the same tooth is considerably shortened. In the lower jaw the enamel pattern shows no characters beyond a general tendency to narrowness of all loops and triangles.

*Measurements.*—Type specimen "(from skin): total length, 148; tail vertebræ, 58; hind foot, 20.2" (True). Lane County specimen: total length, 165; tail vertebræ, 63; hind foot, 20.8 (from fresh specimen by the collector, A. Todd).

*General remarks.*—*Phenacomys longicaudus* differs so strikingly in proportions and color from all other members of the genus that it cannot be compared with any. Its appearance is unique among the voles, though faintly suggested by some of the Asiatic species of *Alticola*.

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PROCEEDINGS

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# SYNOPSIS OF THE AMERICAN SESARMÆ, WITH DESCRIPTION OF A NEW SPECIES.[1]

BY MARY J. RATHBUN.

The American species of *Sesarma* are in much confusion, owing partly to incomplete descriptions and to the study of isolated specimens. The following is a key to all the species known to occur in America, with their principal synonyms, based on a study of types. One new species is described from the Museum at Copenhagen by permission of Dr. F. Meinert.

## Sesarma Say.

### Synopsis of American Species.

A. Carapace with a tooth behind the outer orbital tooth.

B. Manus with two or more pectinated ridges on the upper surface.

Subgenus *Perisesarma* de Man. *africana*[2] * Milne Edwards.

B′. Manus without pectinated ridges on the upper surface.

Subgenus *Sesarma* = *Episesarma* de Man.

C. Front less than half the greatest width of the carapace.

*bidentata* * Benedict.

C′. Front more than half the greatest width of the carapace.

D. Upper surface smooth.

E. Eyes reaching the outer angle of the orbit.

*curacaoensis* de Man.

E′. Eyes not reaching the outer angle of the orbit.

*reticulata*[3] Say.

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[1] Published with the permission of the Secretary of the Smithsonian Institution.

[2] Occurs at Barbados.

[3] Type species of the genus.

* Type examined by the writer.

D′. Upper surface rugose.
E. Hand very broad. *sulcata* Smith.
E′. Hand elongate. *crassipes*† Cano.
A′. Carapace without a tooth behind the outer orbital tooth.
B. Manus with two or more pectinated ridges on the upper surface. ♀
Subgenus *Parasesarma*[1] de Man.
B′. Manus without two or more pectinated ridges on the upper surface.
Subgenus *Holometopus* Milne Edwards = subgenus *Sesarma* de Man.
C. Sides of carapace converging rapidly posteriorly.
*rubripes* Rathbun, new name = *mülleri* Miers.*[2]
C′. Sides of carapace not converging rapidly posteriorly.
D. Protogastric or supra-frontal lobes tuberculate or granulate.
E. Movable finger extraordinarily enlarged along its proximal half. *benedicti* Rathbun, new name = *recta* de Man.[3]
E′. Movable finger not extraordinarily enlarged along its proximal half.
F. Outer surface of hand densely hairy at base of fingers.
*barbimana*† Cano.
F′. Outer surface of hand not densely hairy at base of fingers.
G. Meri of ambulatory legs less than twice as long as broad.
*recta** Randall = *mullerii** A. Milne Edwards.
G′. Meri of ambulatory legs more than twice as long as broad.
H. Front widening considerably toward the lower margin.
*miersii*[4] Rathbun, new name = "*angustipes?*" Miers,* 1881 = *stimpsonii* Miers, 1886,* not 1881.
H′. Front not widening considerably toward the lower margin.
J. Protogastric or supra-frontal lobes faintly granulate.
*cinerea* Bosc.
J′. Protogastric or supra-frontal lobes rough with ruge or lines of granulations.
K. Front not more than 3½ times as wide as high.
*occidentalis** Smith.
K′. Front more than 3½ times as wide as high.
L. Margins of meri of ambulatory legs subparallel for their distal half.
*roberti** Milne Edwards = *americana** Pocock = *bromeliarum** Rathbun.

[1] Not represented in America.
[2] Challenger Report, Zoöl. XVII, 270, pl. xxi, f. 3, 1886, Bahia.
[3] Notes Leyden Mus., XIV, 249, pl. X, f. 4, 1892, Surinam.
[4] This species has not been sufficiently characterized and is described below.
* Type examined by the writer.
† Not seen by the writer.

L′. Margins of meri of ambulatory legs converging from the middle towards the carpal joints.

M. Front deeply concave; protogastric lobes strongly projecting. *augusta** Smith.

M′. Front slightly concave; protogastric lobes slightly projecting.

*angustipes* Dana = *americana** Saussure.

D′. Protogastric or supra-frontal lobes smooth or nearly so.

E. Front less than 4 times as wide as high.

*ricordi** Milne Edwards = *guerini** Milne Edwards = *miniata** Saussure = *angustipes* Stimpson (in part,* at least) = *angustipes* Smith* = *stimpsonii* Miers,* 1881, not 1886, = *cinerea* Heilprin,* 1888, = *cinerea* Ives,* 1891.

E′. Front more than 4 times as wide as high.

*hauseni* Rathbun, new species.

**Sesarma (Holometopus) miersii** Rathbun, new name.

*Sesarma angustipes?* Miers, Proc. Zoöl. Soc. London, 1881, 70, Rat Island, Monte Video.

*Sesarma stimpsonii* Miers, Challenger Rept., Zoöl., XVII, 270, 1886; not *S. stimpsonii* Miers, 1881.

Carapace broader than long, of equal width anteriorly and posteriorly, surface more convex than in *S. cinerea*, regions deeply marked. Carapace, as in *S. roberti*, punctate, the punctæ crowded in places and tending to coalesce; anterior portion rough with tubercles. Except for its width, the carapace has great resemblance to that of *S. roberti*.

Front less than four times as wide as high. Superior lobes less prominent than in *S. roberti*. The middle sinus of the lower margin when viewed from above is much shallower and less rounding than in that species. Viewed from in front the lower margin forms an almost unbroken convex line. The side margins of the front diverge below as in *S. ricordi*.

The lateral margins of the third abdominal segment of the male are arcuate, the abdomen being widest posterior to the distal end of that segment. The terminal segment is as wide as it is long. The appendages terminate in an oblique sinuous margin fringed with hair.

The chelipeds resemble pretty closely those of *S. roberti*. The meri of the ambulatory legs are shorter than in that species, being less than $2\frac{1}{2}$ times as long as wide in the first, third, and fourth pairs, and a little more than $2\frac{1}{2}$ times the width in the second pair. Propodi of first and second pairs hairy above and below; those of the third and fourth pairs hairy only on the distal portion.

*Dimensions.*—♂, Abaco, Bahamas, U. S. Nat. Mus., No. 11372: Length, 19.3 mm.; width, anterior and posterior, 21.1; superior frontal width, 11; inferior, 11.6; depth of front, 3; length of merus of third ambulatory leg, 15.3; width of same, 6.3. In some specimens the posterior width is

* Type examined by the writer.

greater than the anterior; the width of the ambulatory legs is also variable, but as a rule the meri are shorter than in *S. roberti*.

*Distribution.*—Abaco and San Salvador, Bahamas; Swan Island, Caribbean Sea (U. S. Nat. Mus.). Destero, Brazil (Paris Mus.). Rio de Janeiro; Rat Island, Monte Video, type locality (Brit. Mus.)

**Sesarma (Holometopus) hanseni** Rathbun, new species.

Carapace much broader than long, broader anteriorly than posteriorly. Regions well marked; mesogastric very wide behind, and with a curved sulcus parallel to its posterior margin. Surface smooth and punctate and without granulations. Superior margin of front uneven, the inner lobes sloping backward from the middle. Front more than 4 times as wide as high; margin projecting, thin, arcuate in a front view, slightly sinuous in a dorsal view. Terminal segment of abdomen broader than long. Appendages narrow and with slender curved tips.

Merus and carpus of chelipeds with outer surface covered with broken rugose lines; margins denticulate. Hand deep, covered with depressed tubercles; superior margin with a thin denticulate crest. Fingers irregularly toothed; the largest tooth of the dactylus is midway of its length, and fits between the two largest teeth of the pollex. The meri of the ambulatory legs are less than $2\frac{1}{2}$ times their width.

*Dimensions.*—♂: Length, 13.5 mm.; exorbital width, 16.6; posterior width, 15.5; superior frontal width, 9.5; depth of front, 2; length of merus of fourth ambulatory leg, 8; width, 3.7.

*Type locality.*—West Indies, one ♂ (Copenhagen Mus.).

Dedicated to Dr. H. F. Hansen.

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# SYNOPSIS OF THE AMERICAN SPECIES OF *PALICUS* PHILIPPI* (= *CYMOPOLIA*† ROUX), WITH DESCRIPTIONS OF SIX NEW SPECIES.‡

BY MARY J. RATHBUN.

The following summary is based on a study of the specimens collected by the steamers 'Bache,' 'Blake,'§ and 'Albatross,' and is preliminary to a complete report on the genus.

The genus *Palicus* is remarkable not only as the sole representative of a family, but as exhibiting two forms in the male of at least one species (*P. alternatus*).

### SYNOPSIS OF AMERICAN SPECIES.

A. Length of second ambulatory leg less than twice the width of the carapace.

B. Crests on the second and third abdominal segments, and on the fifth sternal segment not forming conspicuous laminiform expansions visible in a dorsal view.

C. Meri of ambulatory legs with strongly dentate anterior crest. Lateral margin of carapace with 4 teeth besides the orbital.

*cristatipes* A. Milne Edwards.

* I have not seen the following paper by Philippi, "*Palicus granulatus*, ein neues Genus der rückenfüssigen Krabben." Zweiter Jahresber. d. Vereins f. Naturk. in Cassel, 11, 1838. Specimens of *Cymopolia caronii* Roux, bearing the inscription '*Palicus granulatus*,' are preserved in the Museum at Berlin, and are perhaps Philippi's types.

† *Cymopolia* used by Lamouroux, Hist. Pol. Coral. Flex., 292, 1816, for a genus of polyps.

‡ Published with the permission of the Secretary of the Smithsonian Institution.

§ Examined through the courtesy of Professor Agassiz.

C′. Meri without strongly dentate anterior crest. Lateral margin of carapace with less than four teeth besides the orbital.

D. Anterior margin of meri of second and third ambulatory legs terminating in a nearly rectangular non-projecting tooth.

E. Lateral teeth of carapace dentiform, acute, scarcely projecting beyond the margin of the carapace. *zonatus* Rathbun.

E′. Lateral teeth tuberculiform or lobiform, projecting from the margin of the carapace.

F. Two frontal lobes, each bilobed.

*alternatus* Rathbun, new species.

F′. Two frontal lobes, each obscurely emarginate.

*isthmius* Rathbun, new species.

D′. Anterior margin of meri of second and third ambulatory legs terminating in a spiniform, projecting tooth.

E. Lateral margin of carapace with three teeth besides the orbital.

*tuberculatus* Faxon.

E′. Lateral margin with two teeth besides the orbital.

F. Branchial regions much swollen.

*obesus* A. Milne Edwards.

F′. Branchial regions not swollen.

G. Granules of carapace very fine, not visible to the naked eye. *dentatus* A. Milne Edwards.

G′. Granules of carapace coarse.

*faxoni* Rathbun, new species.

B′. Crests on the second and third abdominal segments and on the fifth sternal segment forming conspicuous laminiform expansions visible in a dorsal view.

C. Posterior margins of laminiform crests of first and second abdominal segments subparallel in a dorsal view.

*bahamensis* Rathbun, new species.

C′. Posterior margins of laminiform crests of first and second abdominal segments not subparallel, that of the second having a greater median expansion.

D. Ridge above the posterior margin of the carapace one unbroken curve; distal end of meri of ambulatory legs without a tooth.

*depressus* Rathbun, new species.

D′. Ridge above the posterior margin sinuous; distal end of meri with a tooth.

E. Length of carapace more than $\frac{4}{5}$ its width.

*angustus* Rathbun, new species.

E′. Length of carapace $\frac{4}{5}$ its width or less.

*sica* A. Milne Edwards (restricted).

A′. Length of second ambulatory leg more than twice the width of the carapace.

B. Front with two teeth.

C. Chelipeds smooth. *gracilipes* A. Milne Edwards.

C′. Chelipeds tuberculate. *acutifrons* A. Milne Edwards.

B′. Front with four teeth.

C. Lateral teeth 4 besides the orbital. *fragilis* Rathbun.

C′. Lateral teeth less than 4 besides the orbital.

D. Median suborbital lobe midway between the outer and inner lobes.

*cursor* A. Milne Edwards = *dilatata* A. Milne Edwards.

D′. Median suborbital lobe much nearer the outer than the inner lobe. *gracilis* Smith.

**Palicus alternatus** Rathbun, new species.

Carapace subquadrate, coarsely granulate. Front with four distinct lobes, the median pair smaller and more deeply separated from each other than from the outer pair. Superior orbital lobes subquadrate. Outer margin of outer orbital tooth nearly straight. Median lobe of inferior margin most advanced at its inner angle. Lateral teeth two, broad, lobate, obtuse. In large specimens a third very small tooth or tubercle behind the second.

There are two forms of the male in this species. In one the appendages of the first segment of the abdomen are strong and twisted, the tip is bilobed, the inner lobe thinner and longer than the outer. In the second form the appendages are weaker and not twisted, the tip less spreading.

In the first form the chelipeds are very unequal, the left is always slender and weak, the right large and heavy. Both chelipeds are tuberculate and pubescent. The carpus is covered with irregular laminiform lobes; the manus is surmounted by a double crest of the same. The width of the right manus at its distal end equals one-half the length of the carapace. Pollex very short. Dactylus strongly bent down, overlapping the pollex at the tip. Left manus a little more than one-third the width of the right, enlarging but little towards the long and rather narrow fingers.

In the second form of the male the right manus is about twice the width of the left and its fingers are also long and slender. In the females the chelipeds are more nearly equal.

The second ambulatory leg is about twice the length of the carapace; the first reaches about the middle of the propodus of the second; the third reaches about the middle of the dactylus of the second. The meri are rough with squamose tubercles, and have two longitudinal grooves on the upper surface and one on the anterior surface. The anterior margin terminates in a blunt rectangular tooth in the second and third pairs; in the first pair this tooth is produced outward toward the carpus. Posterior margin of the dactyli concave as a whole, but nearly straight for the proximal two-thirds.

The two forms of the male agree in every respect excepting in the chelipeds and abdominal appendages. These forms perhaps represent alternating conditions in the life of an individual similar to those existing in the genus *Cambarus;* the first form that which occurs during the breeding season, the second that which occurs between breeding seasons. No other species of the genus exhibit this phenomenon, a fact which may

be due to the scarcity of material collected and does not prove its non-existence.*

*Dimensions.*—♂, form I: Length, 6.6 mm.; width, 7.6; length of second ambulatory leg, 14; length of merus, 4.4; carpus, 2.2; propodus, 3.6; dactylus, 3.2.

♂, form II: Length, 11 mm.; width, 13.2.

*Distribution.*—*P. alternatus* occurs in from 24 to 60 fathoms off Cape Hatteras, N. C., and in the Gulf of Mexico between the delta of the Mississippi and Cedar Keys, and from Cedar Keys to Florida Straits. It has been taken by the steamers 'Albatross' and 'Blake' and the schooner 'Grampus.'

*Type locality.*—Station 2374, str. 'Albatross,' lat. 29° 11′ 30″ N., long. 85° 29′ W., 26 fathoms (U. S. Nat. Mus., No. 19840).

**Palicus faxoni** Rathbun, new species.

Allied to *P. alternatus*, but longer and narrower; granules of the carapace similar in size; granulated tubercles of the branchial region more elevated and more squamose; median lobes of front more advanced; superior orbital lobes triangular and separated by wider sinuses than in *P. alternatus;* median lobe of the inferior margin subtruncate, inclining slightly forward toward the median line; lateral teeth of the carapace dentiform, acute, projecting outward and forward; ridge above the posterior margin with six linear and a few smaller tubercles.

Abdominal appendages of the single male examined slender, with long, slender tips; just posterior to the terminal portion there is a tridentate lobe on the inner side.

Chelipeds unequal, similar in the two sexes; the right propodus about twice the width of the left. They resemble strongly those of *P. alternatus*, ♂, form II.

Meri of second and third ambulatory legs characterized by a sharp spine at the end of the anterior margin; anterior margin spinulous; upper surface flatter and less coarsely granulate than in *P. alternatus*; last three joints wider than in that species; the dactyli differ in having the proximal half of the posterior margin convex.

*Dimensions.*—♀, station 2596: length, 9.5 mm.; width, 10.7; length of second ambulatory, 18; merus, 5.2; carpus, 3.1; propodus, 4.7; dactylus, 3.7. ♀, Yucatan Bank: length, 15.4; width, 17.3. ♂, station XXX, length, 9.5; width, 10.

*Distribution.*—Taken off Cape Hatteras by the 'Albatross,' station 2596 (*type*, U. S. Nat. Mus., No. 19841), and off Yucatan by the 'Blake,' station XXX; range in depth, 49 to 51 fathoms.

* Professor Smith, in Proc. U. S. Nat. Mus., VI, 22, 1883, describes two forms of the male of *Ethusa microphthalma*, and suggests the possibility of their specific distinctness. They may, however, represent a case similar to that of *P. alternatus*.

**Palicus isthmius** Rathbun, new species.

Allied to *P. alternatus*, but broader. Carapace depressed. Front with median sinus broader than in *P. alternatus;* lateral lobes faintly marked. Preorbital lobe very sinuous, a small but well-marked tooth at its outer angle. Both superior orbital lobes triangular, obtuse. Median lobe of inferior margin subtruncate or slightly arcuate. Lateral teeth of carapace two, directed obliquely outward, the anterior lobiform, the posterior a little longer and subacute.

Chelipeds in the immature ♀ small and feeble, as in *P. alternatus.* Merus of the first pair of ambulatory legs with an acute spiniform tooth instead of the blunt tooth in *P. alternatus.* Meri of the second and third pairs with the distal angle thin and almost a right angle, tipped with a small sharp point. Carpi without lobes on their anterior margins. Third ambulatory leg very little shorter than the second.

*Dimensions.*—Immature ♀ : length, 5.8 mm.; width, 7 ; length of second ambulatory, 13.7; merus, 4; carpus, 2.5; propodus, 3.2; dactylus, 3.3.

*Type locality.*—One specimen only was dredged by the 'Albatross,' station 2145, near Aspinwall, latitude 9° 27′ N., longitude 79° 54′ W., 25 fathoms (U. S. Nat. Mus., No. 7753).

**Palicus sica** (A. Milne Edwards).
**Palicus angustus** Rathbun, new species.
**Palicus depressus** Rathbun, new species.

*Cymopolia sica* A. Milne Edwards, Bull. Mus. Comp. Zoöl., VIII, 29, 1880.

Among the specimens referred to *Cymopolia sica* by its author, there appear three distinct forms, which agree in the following characters: The carapace is granulate, many of the granules forming clusters on the more elevated regions. Front with four small, tuberculiform teeth, the median the most prominent, separated from each other by a deep triangular notch, and from the lateral teeth by very broad, shallow sinuses. The tooth of the superior orbital border nearest the preorbital is arcuate; the next narrower, also obtuse. The median suborbital lobe is subtriangular and much less advanced than the inner lobe. The lateral margin of the carapace bears three small, thickened teeth.

First segment of the abdomen with a narrow carina on either side behind the postero-lateral angle of the carapace. Second carinated throughout its width, the carina much longer in the center. Third segment carinated, but much less sharply. There is also a carina on the sternum in a line with the suture between the second and third abdominal segments; it extends well outwardly, but not so far posteriorly as the second abdominal. These carinæ form horizontal plates, visible in a dorsal view, excepting that of the third abdominal segment in the male.

Chelipeds slender and feeble. Ambulatory legs of moderate length, the third very little shorter than the second, the first very slender and reaching about midway of the carpus of the second. Meri of second and

third with longitudinal rows of spinules and a deep groove on the anterior half; anterior distal angles subrectangular.

The three forms of so-called *sica*, which may be designated as Nos. 1, 2, and 3, differ mainly as follows: No. 2 is much narrower than Nos. 1 and 3; No. 3 is most depressed. Just above the posterior margin there is in No. 3 a continuous ridge following the curve of the margin; in Nos. 1 and 2 there is instead a sinuous line of tubercles, more uneven in No. 1 than in No. 2. Inner suborbital fissure a broader sinus in No. 1 than in Nos. 2 and 3. The median portion of the second abdominal plate is most prominent in No. 1 and least so in No. 3. Ischium of maxilliped much wider in Nos. 2 and 3 than in No. 1; in No. 3 widening considerably toward the merus. Merus of second ambulatory long and comparatively narrow in No. 1; short and very broad in the middle in No. 2, with very convex posterior outline; in No. 3 the merus is of moderate width proximally, but at the distal end is very narrow, with scarcely a trace of a tooth.

The description given by Professor Milne Edwards is applicable to all of the forms above described. Of the ambulatory legs he says, "Les deux derniers articles sont très aplatis et élargis." These articles are widest in No. 2. The dimensions given do not, however, apply to No. 2. I have therefore restricted the name "*sica*" to No. 1, the form taken in greatest abundance by the U. S. Coast Survey steamers 'Bache' and 'Blake.' Form No. 2 may be known as *Palicus angustus*, form No. 3 as *Palicus depressus*.

*Dimensions.*—In *P. sica* the width of the carapace varies from 1.25 times its length in smaller specimens to 1.39 times its length in larger specimens. Length of largest specimen, adult ♀, 9.8 mm.; width, 13.5.

A specimen of *P. angustus* measures 9 mm. long, 10.3 wide; ratio, 1 : 1.14.

A female of *P. depressus* is 7 x 9.4 mm.; ratio, 1 : 1.34. Another specimen measures 6.5 x 8.2 mm.; ratio, 1 : 1.26.

*Distribution.*—*P. sica* is found from the Gulf of Mexico and Florida Keys to Barbados and Grenada, in depths of from 60 to 117 fathoms. It was dredged by the 'Bache' on the west coast of Florida and at Sand Key; by the 'Blake' at stations 32, 36, 132, 149, 253, 293; by the 'Albatross' at stations 2403 and 2641.

*P. angustus* is known only from off Santa Cruz, 117 fathoms, station 32, 'Blake.'

*P. depressus* was taken by the 'Blake' off Santa Cruz, Dominica, and Barbados, in from 56 to 138 fathoms, at stations 132, 192 (type locality), 272, 292, and 293.

**Palicus bahamensis** Rathbun, new species.

This species, although possessing abdominal and sternal laminæ, as in *sica*, *depressus*, and *angustus*, resembles in the characters of the carapace *dentatus* and its allies. Carapace very rough, with coarse granulation. Front divided by a wide and deep V-shaped notch; each lobe thus formed is faintly emarginate. Two superior orbital lobes triangular and obtuse.

Lateral teeth two, subequal in length, acute, and directed outward and only slightly forward. Median suborbital lobe truncate. Lobe at angle of buccal cavity very large and produced far beyond the inner lobe of the inferior orbital margin. Crest above posterior margin sinuous, broken into seven irregular scallops.

Crests on the first two abdominal segments of the ♂ trilobate and subparallel in a dorsal view, that of the first the wider. Third segment with a lobe on each side of the middle, partially visible in a dorsal view. Crest on the fifth sternal segment or that between the bases of the third ambulatory legs about half as wide as the second abdominal segment; its posterior margin is sinuous.

Chelipeds unequal in the male; the right one rather small; manus bicristate above, outer surface granulate, lower margin convex. Pollex slightly deflexed; its length not equal to the width of the manus. Merus of first ambulatory terminating in a large blunt tooth; meri of the second and third armed on the anterior margin with 4 or 5 curving, spiniform teeth; terminal tooth large, subacute; posterior margin spinulous; upper surface with squamose granules. Lobes on the anterior margin of the carpal joints small but distinct. Dactyli slender, posterior margin concave.

*Dimensions.*—♂: Length, 4.8 mm.; width, 5.5; length of second ambulatory (approximate), 11.6; merus of same, 3.2; carpus, 2; propodus, 2.6; dactylus, 2.8.

*Type.*—A single male was taken by the 'Albatross' at station 2651, lat. 24° 2′ N., long. 77° 12′ 45″ W., 97 fathoms, east of Andros Island, Bahamas, in Tongue of Ocean. U. S. Nat. Mus., No. 11394.

VOL. XI, PP. 101-102 APRIL 26, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# TWO NEW MOLES FROM CALIFORNIA AND OREGON.

BY C. HART MERRIAM.

Among the abundant signs of Pocket Gophers (*Thomomys*) observed about our camp on the rim of Crater Lake, Oregon, in August, 1896, were a few ridges which my assistant, Mr. Vernon Bailey, felt convinced were the work of Moles. Assiduous trapping for a number of days, however, failed to bring to light any of these animals until finally, on August 18, a trap which on the previous day had caught a Pocket Gopher was found to contain the long-sought Mole. This animal, on comparison with specimens of *Scapanus californicus* from the Fort Klamath plain, at the south base of Crater Lake Mt., seems to be a distinct species. It is decidedly larger, and differs further in the characters mentioned below; but its affinities are with *californicus* and not with the large *S. townsendi*, its immediate neighbor on the west. The species is here named *Scapanus alpinus*, and is of special interest as being, so far as known, the only strictly mountain Mole in America. It will probably be found to range northward in the Cascade Mountains, and possibly southward in the Sierra Nevada. The type specimen was captured in the Hudsonian zone, at an altitude of about 7000 feet [= 2130 meters].

Another apparently new species was secured by my assistant, Mr. Clark P. Streator, but in a widely different region—the desert region east of the mountains, in the extreme northeastern corner of California. I have named it *Scapanus truei* in honor of Mr. F. W. True, in recognition of his recently published '*Revision of the American Moles.*'

The new forms may be known from the following descriptions:

**Scapanus alpinus** sp. nov.

*Type* from Crater Lake, Mt. Mazama, Oregon. Altitude about 2130 meters [7000 ft.]. No. 79967, ♂ ad., U. S. Nat. Mus., Biological Survey Coll. Collected Aug. 18, 1896, by Vernon Bailey. Original No. 5784.

*General characters.*—Similar to *Scapanus californicus*, but larger, with longer and heavier skull.

*Color.*—Everywhere uniform grayish plumbeous, much as in *californicus*, but without the brownish tinge; widely different from the blackish of *S. townsendi*.

*Cranial and dental characters.*—Skull similar to that of *californicus*, but much longer; molar teeth larger; last (6th) unicuspidate tooth, both upper and lower, peg-like, lacking the posterior blade or cusp of *californicus*.*

*Measurements.*—Type specimen, measured in flesh: total length, 188; tail vertebræ, 38; hind foot, 24.5.† Skull: greatest length, 37; basal length, 32; palatal length, 16.75; greatest zygomatic breadth, 13.5; mastoid breadth, 17.

**Scapanus truei** sp. nov.

*Type* from Lake City, Modoc Co., Calif., No. 79290, ad., U. S. Nat. Mus., Biological Survey Coll. Collected June 15, 1896, by Clark P. Streator. Original No. 5289.

*General characters.*—Similar to *S. californicus*, but paler and more plumbeous in color, and with a distinct inner cusp on last upper premolar.

*Color.*—Everywhere almost clear plumbeous (No. 14, 'olive-gray,' of Ridgway's Nomenclature of Colors), with a faint darker wash on upper parts.

*Cranial and dental characters.*—Skull similar to that of *S. californicus*, but slightly smaller, with narrower palate and decidedly narrower and more slender rostrum. Last upper premolar with a strongly developed, trenchant inner cusp, not present in *californicus*.

*Measurements.*—Type specimen (sex unknown) measured in flesh: total length, 170; tail vertebræ, 34; hind foot, 21. Skull: greatest length, 34.5; basal length, 29; palatal length, 15; zygomatic breadth, 13; mastoid breadth, 16.25.

* This may be the result of wear, as the specimen is old.

† Two specimens of *S. californicus* from Ft. Klamath have the tail 33 and the hind foot 20.5.

Vol. XI, pp. 103-104 April 26, 1897

PROCEEDINGS

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# THREE NEW JUMPING MICE (*ZAPUS*) FROM THE NORTHWEST.

BY C. HART MERRIAM.

There seem to be two well marked groups of species among the American Jerboas or Jumping Mice—the small *Zapus hudsonius* and its immediate allies from the region east of the Rocky Mountains, but including the new form here described under the name *tenellus*, and the large *princeps* and *trinotatus* and their allies from the mountains of the west and the northwest coast. Three new forms are here described—one from Kamloops, in the interior of British Columbia, and two from southwestern Oregon. Of the latter, one inhabits the Cascade Range about Crater Lake, the other the Rogue River Valley.

**Zapus tenellus** sp. nov.

*Type* from Kamloops, British Columbia. No. 66932, ♀ ad., U. S. Nat. Mus., Biological Survey Coll. Collected August 25, 1894, by Clark P. Streator. Original No. 4196.

*General characters.*—Size small; ears rather large; coloration dark; hind feet very slender. Similar to *Z. hudsonius*, but less yellow and very much darker and tail longer.

*Color.*—Dorsal area not sharply defined, grizzled with yellowish; sides olive-yellowish, heavily lined with black hairs; nose, ears, and inner side of legs to heel dusky; tail sharply bicolor: dusky above and at tip all round, whitish below; fore and hind feet soiled whitish.

*Cranial characters.*—Skull similar in size and characters to *Z. hudsonius*.

*Measurements.*—Type specimen: total length, 216; tail vertebræ, 134; hind foot, 31. Average of four specimens from type locality: total length, 208; tail vertebræ, 128.5; hind foot, 31.

**Zapus pacificus** sp. nov.

*Type* from Prospect, Rogue River Valley, Oregon. No. 80445, ♂ yg. ad., U. S. Nat. Mus., Biological Survey Coll. Collected August 29, 1896, by Edward A. Preble. Original No. 1454.

*General characters.*—Size rather small; dorsal area strongly suffused with yellowish.

*Color.*—Dorsal area not strongly defined, but so strongly saturated with yellow that the yellow predominates over the black; sides buffy yellow, moderately lined with black hairs; inner side of legs only slightly darkened; tail sharply bicolor: grayish above, white beneath; fore and hind feet soiled white.

*Cranial characters.*—Contrasted with *Zapus montanus* the skull of *Z. pacificus* is smaller; the rostrum and nasals shorter; audital bullæ smaller; basioccipital *broader* between bullæ; interpterygoid fossa shorter; upper molar series more divaricating anteriorly.

*Measurements.*—Type specimen: total length, 225; tail vertebræ, 141; hind foot, 31.

*Remarks.*—A slightly younger specimen obtained by Mr. Preble at the type locality has the dorsal area even less distinct, the entire upper parts being ochraceous yellow. A still younger specimen in my private collection (No. 3708) from Point Reyes, California, has the upper parts almost uniform deep ochraceous yellow with only the faintest trace of the dorsal area.

**Zapus trinotatus montanus** subsp. nov.

*Type* from Crater Lake, Oregon. No. 79863, ♀ ad., U. S. Nat. Mus., Biological Survey Coll. Collected August 19, 1896, by Edward A. Preble. Original No. 1388.

*General characters.*—Size rather large; similar to *Z. trinotatus*, but somewhat smaller and duller (sides less 'orange'), with shorter ears and feet, and differing slightly in cranial characters.

*Color.*—Dorsal area sharply defined, grizzled dusky and yellowish; sides ochraceous, conspicuously lined with black hairs; inner side of legs to heel dusky; tail sharply bicolor: gray above, white beneath; fore and hind feet soiled white. Belly in young adults washed with yellow.

*Cranial characters.*—Skull similar to that of *Z. trinotatus*, but somewhat smaller; palate narrower; incisive foramina narrower posteriorly; angular process of mandible less strongly developed.

*Measurements.*—Type specimen: total length, 231; tail vertebræ, 137; hind foot, 31. Average of eight from type locality: total length, 230; tail vertebræ, 135.5; hind foot, 31.

VOL. XI, PP. 105-107 MAY 13, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTION OF A NEW SPECIES OF *SPHAEROMA*.*

BY HARRIET RICHARDSON.

Mr. E. Ben Carter has sent to the U. S. National Museum a large number of individuals of an undescribed species of *Sphæroma*, found boring the piers on St. Johns River, at Palatka, Florida. Sections of the wood received at the same time had been reduced, during a period of eight years, from a diameter of 16 inches to one of 7½ inches. The whole surface of the wood was bored with holes averaging in size about 5 mm. in diameter and in an end section arranged in concentric rings between the rings of annual growth, showing the little animal's preference for the soft pine. Very strong mandibles, projecting beyond the labrum in a most conspicuous manner, provide a perfect equipment for this destructive work. Spence Bate describes a species of *Sphæroma* from the Indian Peninsula with similar habits, with which the present species is compared.

**Sphæroma destructor** sp. nov.

Head twice as broad as long, having a small median projection. Eyes lateral and posteriorly situated. The first pair of antennæ, with a flagellum containing eight articles, reach the posterior margin of the head; the second pair of antennæ extend to the post-lateral angle of the first thoracic segment; its flagellum is twelve jointed.

The first and fourth thoracic segments are of equal length and are one and a half times longer than the other thoracic segments. The epimeral parts are distinct from the segments, are quite broad, and terminate laterally in acute angles, which point downward. The seventh thoracic segment bears four tubercles situated in a transverse line.

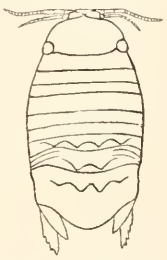

FIG. 3.—*Sphæroma destructor*. Dorsal view. × 3.

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The abdomen is composed of two distinct segments, on the first of which, the post-abdomen, there are two tubercles, one on either side of the median line. Suture lines at the sides of this segment indicate three coalesced segments. The terminal segment is triangularly shaped and rounded posteriorly with an upcurved margin, which extends all around the terminal half of the segment. The whole surface of the abdomen is thickly tuberculated with low but distinct tubercles, each one surmounted with a small tuft of stiff hairs or bristles. On the anterior part four large tubercles are situated in a transverse line, the two center ones being somewhat closer to each other than to the lateral ones. The uropoda extend beyond the extremity of the abdomen, the outer branch being the longer. Both are pointed and similar in shape. The outer edge of the exopodite is provided with four teeth, while that of the endopodite is smooth.

FIG. 4.—*Mandibular appendage.* × 10.

The legs of this species are in three series, according to structure, the first three pairs being alike, the fourth and fifth similar, and the sixth and seventh similar. The legs of the first series are long and slender (fig. 5, *a*), with the second joint or basis nearly cylindrical in shape. The ischium is nearly as long as the basis, and this joint, as well as the merus, is furnished with long straight hairs. The carpus and propodus are likewise long and slender. The legs of the second series, the fourth and fifth pairs, are stout and short, being similar in general form, though differing somewhat in relative proportions. The basis is about half the length of the entire leg, while the joints following the ischium are very short. In the third series the legs are nearly as long as those of the first series, but differ in size and shape. They are stouter and not cylindrical.

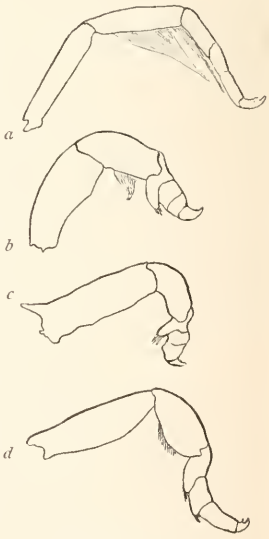


FIG. 5.—*Legs.* × 10.
*a.* Leg of 1st pair.
*b.* " 4th "
*c.* " 5th "
*d.* " 6th "

The whole surface of the body is punctate, and has minute transverse rugæ between the points of depression. In color it is a dark brown, shaded on the edges with a lighter brown.

*Type.*—U. S. Nat. Mus., No. 19857.

In the Ann. of Nat. Hist.* Spence Bate describes a new species of *Sphæroma*, *Sphæroma vastator*, which was procured "from a piece of wood which had formed part of a railway bridge over one of the backwaters of the West Coast of the Indian Peninsula." The wood is described as being "honeycombed with cylindrical holes, in many of which the

*(3) Vol. XVII, 1866, pp. 28–31, pl. ii, fig. 4.

animal was rolled up like a ball." Notwithstanding the close resemblance in habits and appearance of this species, as described and figured, to the present one, there are four points of difference:

I. *The number and arrangement of the tubercles in the two species.*— In *S. rastator* four tubercles are described on each of the last three segments of the thorax, and only two are figured on the anterior portion of the pleon. In the species under discussion, however, there are four tubercles on the seventh segment of the thorax only and six on the abdomen, two on the post-abdomen, and four on the anterior portion of the caudal shield.

II. *The structure of the feet.*—In *S. rastator* the legs of the first three pairs are not proportionately as long as those of the present species. The merus is differently shaped, not being cylindrical in that species, and is relatively shorter. Although Spence Bate mentions no dissimilarity in structure in the legs of the fourth and fifth pairs, still a difference is shown in the cut in the formation of the merus. With our species the difference in these two pairs of legs is merely in proportion. There is a greater resemblance in the sixth and seventh pairs of legs of the two species.

III. *The upcurved margin of the posterior half of the terminal segment of the abdomen.*

IV. *The presence of numerous tubercles furnished with bristle-like hairs upon the abdomen.*

Neither of these points are mentioned in the description of *Sphæroma rastator.*

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# SYNOPSIS OF THE AMERICAN SPECIES OF *ETHUSA*, WITH DESCRIPTION OF A NEW SPECIES.*

BY MARY J. RATHBUN.

The type species of *Ethusa*, *E. mascarone* (Herbst) of the Mediterranean, is represented in the West Indian region by a form so slightly different that it cannot be regarded as more than a subspecies. *E. mascarone americana*. *E. microphthalma* is found in the deeper waters off the Atlantic coast of North America; *E. lata* and *E. ciliatifrons* occur on the Pacific coast of tropical America. To these a fifth species is now added, *E. tenuipes*, from the Gulf of Mexico and Florida Keys.

Synopsis of American Species of *Ethusa*.

A. Eye-stalks long, extending laterally beyond the postorbital spine. *mascarone americana* A. Milne Edwards.

A′. Eye-stalks short, directed forward.

B. Branchio-cardiac lines meeting in front of the heart. *ciliatifrons* Faxon.

B′. Branchio-cardiac lines not meeting in front of the heart.

C. Dactyli of second and third pairs of legs broad, vertically compressed.

D. Third joint of antennæ reaching the extremity of the frontal teeth. *lata* Rathbun = *pubescens* Faxon.

D.′ Third joint of antennæ not reaching the extremity of the frontal teeth. *microphthalma* Smith.

C′. Dactyli of second and third pairs of legs slender, not vertically compressed. *tenuipes* Rathbun, new species.

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**Ethusa tenuipes** Rathbun, new species.

Closely allied to *E. microphthalma* Smith, but a much smaller species. The shape of the carapace and the outline of the front are similar to those of *microphthalma;* the cardiac region is more elevated and surrounded by a deeper groove. The eye-stalks are shorter than in *microphthalma,* the first segment of the antenna reaching the cornea.

The abdomen of the male is narrow; the penultimate segment is slightly narrower at its distal than its proximal end, and is shorter than its distal width. The appendages of the first segment have a lanceolate, foliaceous extremity, and sheathe the appendages of the second segment, which extend far beyond those of the first, and have slender, converging tips.

Chelipeds of the male very unequal, the right the larger. Right manus with upper and lower margins convex. Dactyli of first and second ambulatory legs more slender than in *microphthalma,* not vertically compressed, and having four carinæ, one above, one below, one anterior, and one posterior; dactyli a little wider in a dorsal than in a horizontal view.

*Dimensions.*—♂: length, 6 mm.; width, 5.5.

*Type locality.*—Off Key West, Florida, station 2316, steamer 'Albatross,' 50 fathoms (U. S. Nat. Mus., No. 19855).

*Distribution.*—Also dredged at station 2388 in the Gulf of Mexico, off the Delta of the Mississippi, 35 fathoms.

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PROCEEDINGS

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# DESCRIPTION OF A NEW SPECIES OF *CANCER* FROM LOWER CALIFORNIA, AND ADDITIONAL NOTE ON *SESARMA*.*

BY MARY J. RATHBUN.

In a collection of Crustacea from Lower California recently sent to the U. S. National Museum by Mr. A. W. Anthony, of San Diego, California, are two specimens of *Cancer* which cannot be referred to any known species.

**Cancer anthonyi** Rathbun, new species.

Resembles *C. antennarius* Stimpson. Carapace wider than in *antennarius*, and more convex, especially in the posterior half. Elevated portions of the gastric, branchial, and hepatic regions coarsely granulate. Front narrower than in *antennarius*. Median supraorbital tooth less prominent than in that species. Antennæ shorter.

Antero-lateral teeth nine, including the orbital; broader and less projecting than in *antennarius;* margins denticulate; second to eighth tooth, inclusive, having the posterior margins about twice as long as the anterior; first to sixth tooth, inclusive, obtuse; last three teeth with short, sharp tips, directed forward. Posterior margin with two faint emarginations; in *antennarius* this margin has a well marked tooth.

Suborbital margin with three teeth besides the postorbital; from the median tooth a sharp ridge extends obliquely backward and outward. Outer maxillipeds longer and narrower than in *antennarius;* merus oblong, anterior margins slightly oblique.

The dark color on the fingers extends the entire length of the prehensile margins and less than half the length of the outer margins; in *antennarius*, more than half the length of the outer margins.

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Carpal and propodal joints of the ambulatory legs almost naked. Dactyli with six longitudinal sulci, two superior, two inferior, one anterior and one posterior; in *antennarius* there are eight sulci, three superior, three inferior, one anterior, and one posterior.

Color, brownish red. Lower surface and legs much less hairy than in *antennarius*.

*Dimensions.*—♂: Length, 42.4; width, 65; exorbital width, 18.2 mm. ♀: Length, 35; width, 51; exorbital width, 15 mm.

*Type locality.*—Playa Maria Bay, west coast of Lower California; A. W. Anthony, collector; 1 ♂, 1 ♀ (U. S. Nat. Mus., No. 19856).

## NOTE ON SESARMA.

*Sesarma æquatorialis* Ortmann, Zoöl. Jahrb., Syst., VII, Heft 5, 722, pl. xxiii, f. 14, 1894, Ecuador, should be added to the list of species of *Sesarma* on pages 89–91 of these Proceedings. As Heft 5 of vol. VII is not contained in the library of the Smithsonian Institution, I am unable to supply the characters of this species.

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PROCEEDINGS

OF THE

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MARINE BIOLOGICAL LABORATORY WOODS HOLE MASS.

# REVISION OF THE AMERICAN VOLES OF THE GENUS *EVOTOMYS*.

BY VERNON BAILEY.

The following brief synopsis of the Red-backed Voles is based on a study of specimens in the collection of the U. S. Biological Survey and the private collections of Dr. C. Hart Merriam and Mr. G. S. Miller, Jr., supplemented by a series of the Arctic *Evotomys rutilus* from Alaska in the U. S. National Museum, which I have been permitted to examine through the courtesy of Mr. F. W. True. I am indebted to Mr. Outram Bangs for the privilege of including *Evotomys proteus*, an interesting new species from Labrador, of which he has kindly sent me his manuscript description and a series of specimens. In all, 650 specimens of *Evotomys* from 116 localities have been examined, and while it is still desirable to obtain material from many additional localities, especially specimens in different pelages from the same place, the present collections cover the ground fairly well.

The genus *Evotomys* is circumpolar, inhabiting the northern parts of Europe, Siberia, and North America. The only circumpolar species is the Arctic *E. rutilus*, which does not undergo any considerable change throughout the circumference of the Arctic Zone. None of the other species are common to both continents. The North American forms are boreal in range, covering almost the whole of Alaska, Canada, and the colder parts of the northern United States, and extending southward in the mountains to North Carolina and Colorado, and along the sea coasts to New Jersey and northern California. Excepting the southern Sierra Nevada in California and a few isolated mountains in various

parts of the west, they fill the whole Boreal Zone of North America. In places where they range into a lower zone, local conditions are such as to induce a strong mixture of boreal species into the flora and fauna. This is most noticeable in the coast regions.

The material at hand shows the genus to be wonderfully uniform and the species closely interrelated. No widely divergent forms appear, and several of those now distinguished by names can be traced by every degree of intergradation to the forms from which they have become differentiated. Others in the process of separation have not gone far enough to warrant recognition by name. By mapping the distribution of the several species the more northern are seen to occupy much larger areas than the southern. Thus the Arctic *E. rutilus* is common to the polar parts of both continents, and the northern *E. gapperi* ranges from the Atlantic coast to the Rocky Mountains of British Columbia, while the more southern forms—as *carolinensis*, *galei*, and *californicus*—are restricted to limited areas. In commenting on these facts nearly ten years ago, Dr. Merriam says: "In high latitudes the climatic and general physiographic conditions are comparatively uniform, and boreal localities are not subject to the great and sometimes sudden changes with longitude that are so frequent in temperate and tropical regions. Hence it follows that the splitting up of specific types into subspecific forms from environmental agencies is much less common within the Arctic circle than farther south. Stated differently, boreal species are far more stable and persistent than those inhabiting warmer countries. In view of this fact, it is not surprising that the circumpolar *E. rutilus* presents but one phase throughout its entire range (specimens from Scandinavia, Siberia, and Arctic America being practically indistinguishable), while its more southern representatives have become variously modified."*

*Generic characters.*—The more important generic characters of *Evotomys* are cranial and dental, but color alone is sufficient for the recognition of the North American species, and also of the three European species—*rufocanus*, *glareolus*, and *rutilus*—that have come into my hands. Except the gray phase in two dichromatic species, all are characterized by a rufescent or reddish brown dorsal stripe which extends the whole length of the back.

* MS notes on the genus *Evotomys*, written in 1888, and placed at my disposal by Dr. C. Hart Merriam.

The eyes are small, and the ears, except in a single species, *E. ungava*, are long enough to project above the fur. The feet are small. The tail is rather short, varying from 23 to 33 percent of the total length. The fur in winter is long and soft; in summer in most species it is short and harsh. Lateral glands, similar to those of the subgenus *Arvicola*, are usually present in adult males. They are situated on the flanks, one on each side, and average about 10 mm. in diameter. The hair covering these glands is doubly dense and usually differs in color and texture from that of surrounding parts, forming more or less conspicuous spots. The number of young produced at a birth varies from 4 to 6, but 4 is the more common number. There are 8 mammæ, arranged as follows: inguinal, $\frac{2}{2}$; pectoral, $\frac{2}{2}$.

The cranial characters of *Evotomys* are thus summed up by Mr. Gerrit S. Miller, Jr., in his recent paper on the genera of *Microtinæ*:* "The skull of *Evotomys*, . . . as compared with that of the other voles, is characterized by a general weakness and lack of angularity. All the outlines are full and rounded, and the ridges and furrows are slightly developed, even in extreme old age. The interorbital region is broader and the audital bullæ are larger and more inflated than usual in *Microtus* and *Phenacomys*. On the other hand, the zygomata are very slender and scarcely widened in the region of contact between the jugal and the zygomatic process of the maxillary. The mandible also is slender and weak. The bony palate terminates in a thin edged shelf continuous between the alveoli of the posterior incisors. . . . The structure is very different from that found in *Phenacomys* and in typical *Microtus*."

The teeth, while truly microtine in the arrangement of the prisms, differ from those of *Microtus* and resemble those of *Phenacomys* in having the molars always two-rooted in adults and the root of the lower incisor falling short of the dental foramen; they differ from those of *Phenacomys* in the approximately equal depth of outer and inner reëntrant angles in the lower molars.

*Habits.*—Little is known of the habits of the Arctic *E. rutilus*, but most, and probably all, of the species inhabiting the United States have very similar habits. They live in cool, moist woods and brush lands, and seem to delight in the deepest shade and the cover of fallen leaves, tangled weeds, and half-decayed logs. Their nests are built in underground burrows, under logs, or

* North American Fauna, No. 12, p. 43, July, 1896.

under cover of old leaves. A trap set under the edge of a half-rotten log in the woods is pretty sure to get a Red-back if a shrew does not happen along first. Though mainly nocturnal, they are sometimes seen in the daytime. A rustling in the dry leaves and a quick brown flash are the usual evidences of their presence, unless one has the patience to sit for hours in the woods watching for them. I have surprised them by suddenly turning over a log and tipping them rudely out of their nests; have caught them in my hands as they scampered from their feeding grounds to their burrows, and have watched them gliding about among their favorite food plants. Early one morning, when camped in the Big Snowy Mountains in Montana, I was watching the Pine Squirrels climb to the tallest spruce tops to warm themselves in the first rays of sunlight, when the leaves moved and out came an *Evotomys* only a few feet away. After eyeing me intently for a moment he began to move about as freely as if I had been a stump. His ears were erect and constantly changing position, his eyes were bright and prominent, and his nose and whiskers were in constant motion. His color harmonized beautifully with the reddish-brown leaves and the yellow and gray stems of dry grass as he scampered from one plant to another, reaching up to bite off the stems, and then hunching himself up in a fluffy, round ball to eat from his hands, while keeping one eye on me.

In winter these mice do not hibernate, nor have I ever found evidence of their storing provisions. They make long tunnels under the snow, through which they travel about with perfect security from a host of enemies, while they procure the tender grass blades and ripe seeds as easily from the surface of the ground as when the white blanket is not above them. All sorts of seeds and green vegetation are eaten, but grass is the favorite food, especially the half-blanched, tender base of the young grass blades.

Nineteen species and subspecies are here recognized as inhabiting Canada and the United States. Of these, five are described as new—one by Mr. Bangs and four by the writer.

List of American Species and Subspecies of Evotomys, with Type Localities.

*rutilus* ..... Siberia, east of the Obi.
*wrangeli* ..... Wrangel Island, Alaska.
*dawsoni* ..... Finlayson River, Northwest Territory, Canada.

| | |
|---|---|
| *gapperi* | Near Lake Simcoe, Ontario, Canada. |
| " *ochraceus* | Mount Washington, New Hampshire. |
| " *rhoadsi* | Mays Landing, New Jersey. |
| " *loringi* | Portland, North Dakota. |
| " *galei* | Ward, Colorado. |
| " *saturatus* | Nelson, British Columbia. |
| *brevicaudus* | Custer, Black Hills, South Dakota. |
| *carolinensis* | Roan Mountain, North Carolina. |
| *ungava* | Fort Chimo, Ungava. |
| *idahoensis* | Sawtooth Lake, Idaho. |
| *mazama* | Crater Lake, Oregon. |
| *obscurus* | Prospect, Oregon. |
| *californicus* | Eureka, California. |
| *occidentalis* | Aberdeen, Washington. |
| *nivarius* | Mount Ellinor, Olympic Mountains, Washington. |
| *proteus* | Hamilton Inlet, Labrador. |

KEY TO SPECIES AND SUBSPECIES OF EVOTOMYS.

*Ears distinctly rufous-tipped, not gray or dusky.*

Tail more than twice the length of hind foot.

Dorsal stripe not sharply defined.

Ears small, scarcely protruding from fur, dorsal area ill defined, dull chestnut ..... *ungava.*

Ears large, prominent above fur, dorsal area dark chestnut, blending with color of sides (winter pelage) ..... *carolinensis.*

Dorsal stripe sharply defined.

Tail scarcely more than twice the length of hind foot, about 27 per cent. of total length.

Dorsal stripe bright chestnut, with scattered black hairs, color sometimes dichromatic. . *gapperi.*

Dorsal stripe dull rusty rufous without black hairs, color not dichromatic ..... *ochraceus.*

Tail considerably more than twice the length of hind foot, about 30 per cent. of total length.

Large, hind foot 20 or more; colors dichromatic, a red and a gray pelage ..... *proteus.*

Smaller, hind foot less than 20; not dichromatic.

Skull with pronounced superciliary ridges in adults, size medium ..... *galei.*

Skull without pronounced superciliary ridges in adults, slightly larger ..... *saturatus.*

Tail less than twice the length of hind foot.

Dorsal stripe sharply defined, tail bicolor.

Size large, foot 20 mm., dorsal stripe ferruginous.

Tail about 30 mm. long, thick, and densely bristly ..... *rutilus.*
Tail about 33 mm. long, not very thick or densely bristly ..... *dawsoni.*
Size small, hind foot 18–19 mm., dorsal stripe not ferruginous.
Smallest of the genus, foot 18, dorsal stripe dark, rich chestnut in summer ..... *loringi.*
Slightly larger, foot 19, tail relatively shorter, dorsal stripe pale chestnut in summer ... *brevicaudus.*
Dorsal stripe not sharply defined, blending with color of sides.
Tail indistinctly bicolor, dorsal stripe dull brownish ..... *wrangeli.*
Tail distinctly bicolor, dorsal stripe plain chestnut ..... *rhoadsi.*

*Ears gray or dusky, not distinctly rufous-tipped.*

Posterior edge of palate straight, colors bright, tail bicolor.
Dorsal stripe not sharply defined (dark chestnut in summer pelage) ..... *carolinensis.*
Dorsal stripe sharply defined (hazel or chestnut).
Sides clear, bright gray, skull long and narrow, hind foot 20 ..... *idahoensis.*
Sides dark buffy gray, skull wide and angular, hind foot 18 ..... *nivarius.*
Posterior edge of palate with a median projection, colors dark in all but *mazama.*
Colors dusky or blackish above.
Tail unicolor or nearly so, dusky or blackish, hind foot 18 ..... *occidentalis.*
Tail bicolor, blackish above, whitish below, hind foot about 21.
Tail long, colors dark, skull thick and wide interorbitally ..... *californicus.*
Tail shorter, colors not so blackish, skull slender and narrower interorbitally ..... *obscurus.*
Colors not dusky or blackish.
Dorsal area dull hazel, sides grayish, skull broad, angular, and flat-topped ..... *mazama.*

**Evotomys rutilus** (Pallas).

*Mus rutilus* Pallas, Nov. Sp. Quad. Glirium, 246, pl. xiv B, 1778.

*Geographic distribution.*—Arctic regions of America, Europe, and Siberia.

*Type locality.*—Siberia, east of the Obi.

*General characters.*—Rather large and bright colored; always recognizable by the short, thick, bristly tail and stout hind feet; fur long and soft; feet and ears densely haired.

*Color.*—*Winter pelage:* dorsal stripe well defined, extending from in front of ears to rump, rich rufous or ferruginous, slightly darkened with black tipped hairs; face, sides, and rump bright buffy ochraceous; belly heavily washed with buff or rich cream; feet white; ears rufous like back; tail sharply bicolor, buff or ochraceous buff below, above brownish at base, blackish along terminal portion. *Summer pelage:* dorsal stripe darker; sides less strongly buffy; belly soiled whitish; feet gray; tail less sharply bicolor.

*Cranial characters.*—Skull thick and strong, not much ridged or angulated; upper outline slightly arched, not concave interorbitally; brain case squarish; ascending arm of premaxilla terminating on a line with truncate end of nasals; audital bullæ moderately large and inflated, hiding ends of pterygoids in side profile; posterior edge of palate slightly notched; lateral bridges wanting, so that instead of a shelf the bone stands out as a tongue;* molars not peculiar; incisors stout, with orange colored enamel surface.

*Measurements.*—In the original description Pallas gives the following measurements: "Nose to anus, 3″ 7½‴ [= 98 mm.]; tail vertebræ, 1″ 1‴ [= 29 mm.]; pencil, 3‴ [= 7 mm.]; hind foot, 8⅛‴ [18 mm.]." Two specimens from Finmark and Sweden measure in the dry skin: tail, with vertebræ left in, 24; hind foot, 20. An alcoholic specimen from St. Michaels, Alaska: total length, 130; tail vertebræ, 30; hind foot, 20. *Skull* of adult (No. 6555, Merriam collection) from Finmark: basal length, 23.5; nasals, 7.8; zygomatic breadth, 14.3; mastoid breadth, 12; alveolar length of upper molar series, 5.

*General remarks.*—The above description is based on four specimens in the Merriam collection from Lapland and Finmark, which are assumed to be typical *rutilus*. The American form is similar in most details, but, as all of the available skins are in wretched condition and without reliable measurements, a satisfactory comparison is impossible.

The side glands do not show in any of the four European specimens, though one is marked ♂ and two are unmarked for sex. A faint trace of them may be seen in two of the specimens from St. Michaels, Alaska.

In the original description Pallas states that *Evotomys rutilus* inhabits the woods locally, but is also found in the cold Arctic regions as far north as the Gulf of Obi. In Arctic America it has been taken at various places on the Barren Grounds to as far north as Fort Anderson, as well as at the edge of timber. As yet too little is known of its range to safely attribute it to the Barren Grounds, where it probably belongs.

*Specimens examined.*—Total number, 27; 23 in U. S. Nat. Mus.; 4 from Europe, in Merriam collection.

*Alaska:* St. Michaels, 17; Kagiktowik, 2; Fort Yukon, 2.

*Northwest Territory:* Fort Anderson, 1; Fort Simpson, 1.

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* In Alaska specimens the lateral bridges are usually complete. This and other slight differences may separate the American from the Old World form of *rutilus* when series of good specimens of the two can be brought together.

**Evotomys wrangeli** sp. nov.

*Type* from Wrangel, Wrangel Island, Alaska. No. 74724, ♀ ad., U. S. Nat. Mus., Biological Survey Coll. Collected Sept. 1, 1895, by C. P. Streator. Collector's number, 4835.

*Geographic distribution.*—Known only from Wrangel and Revillagigedo Islands, southern Alaska.

*General characters.*—A large, dull-colored species entirely distinct from any known form. Tail short, rarely twice as long as hind foot; fur thick and long in both young and adults collected early in September; ears well clothed with short hairs, distinctly rufous tipped. Side glands well developed in one specimen of the series.

*Color.*—Dorsal area dull dark chestnut with a liver brown tone, covering whole back from eyes to base of tail, including ears, and shading gradually into the sepia gray of sides and cheeks; sides more or less suffused with buffy yellowish; belly dark plumbeous, washed with whitish or buffy-ochraceous; projecting part of ear and tuft of long hairs in front of ear color of back; no postauricular spot; feet dusky gray in adults, sooty in young; tail bicolor, soiled buffy below, blackish above, darker and less distinctly bicolor in immature specimens. In one adult ♂, No. 74728, the white hairs covering the side glands form oval patches half an inch in length.

*Cranial characters.*—Skull long and narrow, not thick or angular; rostrum long and decurved; zygomata smoothly arched; nasals usually notched, rarely truncate posteriorally, terminating on a line with premaxillæ; frontals slightly concave posteriorally; audital bullæ of medium size; palatine bones short, anterior end rounded, posterior edge straight; lateral bridges complete before maturity; incisors large, molar series long.

*Measurements.*—Average of 4 adults (2 ♂ and 2 ♀) from Wrangel: total length, 147; tail vertebræ, 37; hind foot, 20. *Skull* of type: basal length, 24.3; nasals, 8; zygomatic breadth, 13.5; mastoid breadth, 11; alveolar length of upper molar series, 5.5.

*Remarks.*—The above description is based on 18 specimens from Wrangel, taken from September 1 to 12. The series includes specimens of every size, from quarter-grown young to old adults, and shows very uniform coloration, except the usual brightening with age and variation in color of belly. Four specimens in worn summer pelage have the dorsal area brighter chestnut and the sides decidedly more yellowish than in the rest of the series. All of the specimens from Loring have the bellies strongly washed with buffy-ochraceous, while more than half of those from Wrangel have whitish bellies.

In no way does *E. wrangeli* show a close relationship to any other American species. In size and relative proportions it comes closest to *E. dawsoni*, from which it differs widely in coloration and more widely in cranial characters. With the long-tailed species south and east of its range there is no need of comparison.

*Specimens examined.*—Total number, 35, from two islands on the coast of *Alaska:* Wrangel, 18; Loring, 17.

### Evotomys dawsoni Merriam.

*Evotomys dawsoni* Merriam, American Naturalist, XXII, 649, July, 1888.

*Type locality.*—Finlayson River (a northern source of Liard River, NWT., lat. 61° 30′ N., long. 129° 30′ W., altitude 3000 feet [915 meters]).

*Geographic distribution.*—From Finlayson River and Fort Liard west to Yakutat and Juneau, and north along the coast to Prince William Sound.

*General characters.*—Robust, with large body and short tail; tail rarely twice as long as hind foot, well haired, but not bristly as in *rutilus;* ears prominent and well haired; colors bright.

*Color.*—Dorsal stripe sharply defined, reaching from just back of eyes to base of tail, bright ferruginous with few dark hairs; sides, face, and rump buffy-ochraceous; belly thinly washed with pale buff; tail distinctly bicolor, clear buffy-ochraceous below, a mixture of rufous and blackish hairs above; feet thinly clothed with buffy and dusky hairs; ears covered on inner surface of projecting tips with short, rufous hairs; an indistinct yellowish postauricular spot; eyes encircled by faint yellowish rings; tufts of rufous hairs fall back from in front and fill openings of ears; a small white throat patch marks 10 out of 29 specimens; spot covering side glands inconspicuous.

*Cranial characters.*—Skull large and thick-walled, relatively short, wide, and angular, with the smallest and flattest audital bullæ of any American species; nasals terminating on a line with ascending arm of premaxillæ, pointed in immature, rounded in adult skulls, never truncate; pterygoids strong and prominent, the ends showing in lateral profile above the small, flattened bullæ; basioccipital unusually wide between bullæ; palatines short, rectangular, with lateral bridges incomplete except in skulls of old individuals; posterior margin of palate with a central notch, deepest in immature specimens; incisors large, with dark orange enamel; molar series long and narrow.

*Measurements.*—Average of 8 adults from Yakutat (4 ♂ and 4 ♀): total length, 144; tail vertebræ, 33; hind foot, 20. *Skull*, No. 73566, adult ♂, basal length, 22.5; nasals, 7.5; zygomatic breadth, 14; mastoid breadth, 12.2; alveolar length of upper molar series, 5.

*Remarks.*—The type was collected June 23, 1887, by Dr. George M. Dawson, Director of the Geological and Natural History Survey of Canada. Through the kindness of Dr. Dawson it is now before me for comparison with a large series of skins and skulls from Yakutat and Juneau, Alaska. It is gratifying to find that the type agrees in every particular with this series of specimens, and that the name *Evotomys dawsoni* stands for this large and handsome species. The type was not fully adult, and unfortunately was mounted from a half relaxed skin, so that the size is greatly reduced. The tail vertebræ were not removed, and the tail has dried short, but the hind foot and ear give reliable measurements for comparison. The skull is badly broken, but the teeth give good characters for comparison. The openly communicating loops and the length of the molar series as a whole may be perfectly matched in slightly immature skulls from Yakutat.

The combination of large size and short tail, notched palate and small audital bullæ, while distinctly separating the species from all others south of its range in America, brings it in closer relationship with *E. rutilus*. From *rutilus*, however, it differs in longer, slenderer, less hairy tail, slenderer feet, duller color, with less rufous on ears, and the following important cranial characters: skull less massive; rostrum longer and slenderer; audital bullæ smaller; pterygoids more prominent; nasals sharp tipped or rounded posteriorly instead of truncate; molar series much narrower and slenderer. In external characters it slightly resembles *E. rufocanus** of northern Europe, but differs widely from that species in cranial characters.

*Specimens examined.*—Total number 38, from 5 localities.

*Northwest Territory:* Finlayson River, 1, the type.

*British Columbia:* Fort Liard, 2.

*Alaska:* Yakutat, 29; Juneau, 3; Prince William Sound, 3.

### Evotomys gapperi (Vigors).

*Arvicola gapperi* Vigors, Zoöl. Jour., vol. V, p. 204, pl. ix, 1830.
*Evotomys fuscodorsalis* Allen, Bull. Am. Mus. Nat. Hist., vol. VI, p. 103, 1894.

*Type locality.*—Vicinity of Lake Simcoe, Ontario, Canada.

*Geographic distribution.*—From Massachusetts, New Jersey, and Pennsylvania northward and from the Atlantic coast westward to the Rocky Mountains in Canada.

*General characters.*—Small, slender, and bright colored, with slender feet and a medium length tail. Of the American species it most nearly resembles *E. glareolus* of Europe.†

*Color.*—*Winter pelage:* dorsal stripe from just back of eyes to base of tail, bright chestnut, with numerous black hairs and a slight frosted tinge from subterminal white portion of part of the rufous-tipped hairs; sides bright buffy-ochraceous; belly washed with pale buff; feet silvery gray; tail bicolor, grayish buff to the tip below, brownish above, with upper part of pencil black. In high pelage a rufous stripe extends through eye

**Evotomys rufocanus* (Sundevall) of northern Europe is remarkable for its large molars and almost microtine form of skull. It is the most divergent form of the genus known, with dorsal stripe yellowish rufous; sides, face, and rump clear gray; tail short; hind feet large.

*Measurement* of a dry skin from Lapland (No. $\frac{3764}{63556}$, ♂, Merriam collection): total length, 138; tail vertebræ, 33; hind foot, 20. *Skull:* basal length, 25; nasals, 7.6; zygomatic breadth, 15; mastoid breadth, 12.2; alveolar length of upper molar series, 6.7.

† *Evotomys gapperi* differs from *E. glareolus* of Oxfordshire, England, in better defined dorsal stripe and less extensive rufous on ears and face, slightly lighter coloration, and relatively shorter tail. I fail to discover tangible cranial differences.

to black spot at base of mustache. *Summer pelage:* darker all over, with more dusky on feet and tail. *Young:* when half grown, similar to adults, but with thinner surface colors, through which the slaty under fur shows.

*Cranial characters.*—Skull small and slender, not ridged or angular, except in very old individuals; audital bullæ small, full, and rounded, less angular, elongated, and appressed than in *carolinensis;* palate straight edged, or rarely with a slight central projection; molar row slender.

*Measurements.*—Average of 4 adults assumed to be typical from Locust Grove, N. Y., measured by Dr. C. Hart Merriam: total length, 141; tail vertebræ, 37; hind foot, 18.1. Average of 10 adults from Elizabethtown, N. Y., measured by Gerrit S. Miller, Jr.: total length, 141; tail vertebræ, 39; hind foot, 18.3. Average of 10 adults from Peterboro, N. Y.: 145; 40; 18.3. *Skull* from Emsdale, Ontario, Canada, old ♂, No. 75896: basal length, 21.6; nasals, 6.5; zygomatic breadth, 13.3; mastoid breadth, 11.2; length of upper molar series, 5.

*Remarks.*—*Erotomys gapperi*, with the possible exception of *E. rutilus*, occupies the largest area of any species in America, and, as might be expected, presents considerable variation in the extremes of its range. Some of the peripheral forms have become sufficiently marked to be worthy of recognition by name, while others are barely distinguishable from the central form. A decrease in size takes place in the prairie country of Minnesota and the Dakotas; an increase beyond the normal in the northern Rocky Mountains. North and east of the type locality another increase is noticeable, especially in the feet. Specimens from Godbout, Quebec, are larger even than *ochraceous*, though in color they appear to be darker instead of lighter than *gapperi;* but they have been preserved in wood alcohol, which has doubtless changed the color.

Another peculiarity of the northeastern animal as it enters the Hudsonian zone is a tendency to dichromatism. Dr. Allen first made known the abnormal phase from Trousers Lake, New Brunswick, but supposing it characterized a new species gave it the name *fuscodorsalis.** Normal, and what were considered typical, *gapperi* were secured at the same place and at the same time as the others. During the past summer Mr. Gerrit S. Miller, Jr., collected series of specimens in both the gray and the red pelages at Nepigon and Peninsula on the extreme north shore of Lake Superior, which he has kindly placed at my disposal. In a critical comparison of measurements, skulls, and external characters of the two forms I find no difference other than color, and am compelled to agree with the previous conclusions of Mr. Miller† that the gray animal represents only a color phase.

The gray form is characterized by the entire absence of a rufous dorsal stripe, in place of which there is usually a sooty or black stripe; by clear gray sides and light gray wash of belly, and in very dark specimens by clear black upper surface of tail.

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* Bull. Am. Mus. Nat. Hist., vol. VI, 103, 1894.

† Notes on the Mammals of Ontario, by Gerrit S. Miller, Jr. Proc. Bost. Soc. Nat. Hist., vol. 28, p. 16, April, 1897.

*Specimens examined:*
*Massachusetts:* Wilmington, 5.
*Pennsylvania:* Renovo, 5.
*New Hampshire:* Ossipee, 17.
*New York:* Lake George, 13; Locust Grove, 5.
*Minnesota:* Two Harbors, 18; Tower, 5.
*Ontario:* Emsdale, 1; Peninsula, 5; Nepigon, 4.
*Quebec:* Godbout, 10.
*Manitoba:* Rat Portage, 1.
*Assiniboia:* Indian Head, 5.
*Saskatchewan:* Wingard, 7; Carlton, 1.
*Alberta:* South Edmonton, 25; St. Albert, 2; Muskeg Creek (lat. 54°, long. 119°), 11; fifteen miles west of Henry House, 1, im.; fifteen miles south of Henry House, 1; Canmore, 1; Banff, 4.
*British Columbia:* Field, 1, im.

### Evotomys gapperi ochraceus Miller.

*Evotomys gapperi ochraceus* Miller, Proc. Bost. Soc. Nat. Hist., vol. XXVI, p. 193, March 24, 1894.

*Type locality.*—Mount Washington, New Hampshire (Alpine Garden, at 5400 feet altitude).

*Geographic distribution.*—The White Mountains of New Hampshire and (probably eastward to) Nova Scotia.

*General characters.*—Similar to *E. gapperi*, but slightly larger and much duller and paler; fur long and lax; skull as in *gapperi*.

*Color.*—Type specimen: dorsal area faintly outlined, pale dull rusty rufous, with no black hairs; sides buffy clay color; belly plumbeous, lightly washed with dirty whitish; feet gray; tail bicolor, buffy below, brownish above; upper part of pencil blackish; ears well haired, upper edges pale fulvous.

*Cranial characters.*—Skull of type not appreciably different from that of typical *gapperi*.

*Measurements.*—Type, measured in flesh by Gerrit S. Miller, Jr.: total length, 148; tail vertebræ, 39.6; hind foot, 19. *Skull* of type: basal length, 22; nasals, 6.7; zygomatic breadth, 13; mastoid breadth, 11.3; upper molar series, 5.

*General remarks.*—This subspecies differs from typical *gapperi* in paler, duller coloration—the opposite extreme from the dark, rich *carolinensis* which inhabits the tops of the mountains of North Carolina. Specimens from Ossipee, N. H., are evidently intermediate between *gapperi* and *ochraceus*. In size they even exceed *ochraceus*, and in color they are slightly paler than true *gapperi*. Specimens from Digby and James River, Nova Scotia, kindly placed at my disposal by Mr. Outram Bangs, are plainly referable to *ochraceus*, though with a slightly darker, brighter dorsal stripe than the type.

### Evotomys gapperi rhoadsi Stone.

*Evotomys gapperii rhoadsii* Stone, Am. Nat., vol. XXVII, p. 54, Jan., 1893.

*Type locality.*—Mays Landing, New Jersey.

*General characters.*—Similar to typical *gapperi* but with slightly darker dorsal stripe, less buffy sides, slightly shorter tail, and larger hind foot. The body measurements, as well as the skulls, show the animal to be identical in size with *gapperi*, the difference in dimensions appearing only in length of tail and foot.

*Color.*—Dorsal area, extending from between eyes to base of tail, plain chestnut; sides buffy gray; belly washed with buff or whitish; tail, feet, and ears as in *gapperi*.

*Measurements.*—Average of 3 young adults from type locality, measured in the flesh by J. Alden Loring: total length, 139.3; tail vertebræ, 36; hind foot, 20. *Skull* (adult ♂, No. 76679): basal length, 21.5; nasals, 7; zygomatic breadth, 13.5; mastoid breadth, 11.3; alveolar length of upper molar series, 5.2.

*General remarks.*—Three adult topotypes collected by J. Alden Loring at Mays Landing, New Jersey, February 29 and March 1, agree in part with the original description of the subspecies. The slight shortness of the tail compared with that of typical *gapperi* is entirely within the range of individual variation and discrepancies in methods of taking measurements. If a more extensive series of specimens should prove the color and foot characters inconstant, the subspecies will have to be given up. With the material in hand I prefer to retain it, though other more marked forms remain unnamed. The nearest localities to Mays Landing, N. J., from which I have examined specimens of *Evotomys* are Wilmington, Mass., and near Renovo, Penn. These specimens are fairly typical *gapperi* with no tendency toward *rhoadsi*, and Mr. Rhoads has recorded *gapperi* from northern New Jersey and from Monroe and Pike counties, in northeastern Pennsylvania.

### Evotomys gapperi loringi,* subsp. nov.

*Type* from Portland, North Dakota, No. 75795, ♂ ad., U. S. Nat. Mus., Biological Survey Coll. Collected Nov. 22, 1895, by J. Alden Loring. Collector's number, 3438.

*Geographic distribution.*—Timbered valleys along edge of plains in Minnesota and eastern North and South Dakota.

*General characters.*—Smallest *Evotomys* known in America, with bright coloration and narrow, slender skull.

*Color.*—*Full winter pelage:* dorsal stripe sharply defined, extending from anterior base of ears back between ears to rump, pale reddish hazel, scarcely darkened with black hairs and frosted from the presence of a white subterminal zone. In some specimens with the maximum of white the back is fairly hoary, in others the chestnut predominates and conceals the white zone. Face, sides, and rump, bright grayish ash, more

* Named for the collector of the type series, Mr. J. Alden Loring.

or less washed with buffy; belly pure white or rarely creamy white; ears pale chestnut; feet pure white; tail sharply bicolor, whitish below, blackish brown above; pencil black above, a few white hairs below. Adult males with large whitish or light grayish spots over the side glands. *Summer pelage:* dorsal stripe dark, rich chestnut; sides and face pale bister, more or less suffused with yellowish; belly thinly washed with white or whitish; feet dusky; tail darker and less sharply bicolor; ears brownish; side spots in old males sooty gray. Young slightly darker than adults.

*Cranial characters.*—Skull, compared with that of *gapperi*, smaller and relatively narrower and slenderer; even in old age not ridged or angular; andital bullæ less rounded and inflated than in *gapperi;* posterior edge of palate straight or slightly projecting on median line.

*Measurements.*—Average of 18 adults from type locality, measured in the flesh by J. Alden Loring: total length, 123; tail vertebræ, 31.5; hind foot, 17.9; tail, 25.5 per cent. of total length. *Skull* of type: basal length, 21.5; nasals, 6 8; zygomatic breadth, 12.8; mastoid breadth, 10.9; length of upper molar series, 5.

*General remarks.*—There is no climatic or topographic barrier to prevent *Evotomys* from ranging continuously from the type locality of *gapperi* to all of the points from which *loringi* is known. Good series of specimens from a chain of intermediate localities show direct connection, and prove that the form to which the name *loringi* is applied has developed as it reached out on the dryer, more open region along the edge of the prairies. The extremes of the form come from the farthest outlying localities. Specimens from the north shore of Lake Superior and thence westerly as far as Tower, Minnesota, are fairly typical *gapperi.* Those from Hinckley and Bridgman, near the middle of the State, are nearer *loringi*, while Minneapolis and Elk River specimens are almost typical. Specimens from Browns Valley, Minnesota, Fort Sisseton, South Dakota, and Portland, North Dakota, are typical. Two from Pembina, North Dakota, are doubtful, and one from Carberry, Manitoba, is clearly intermediate.

*Specimens examined.*—Total number, 56, from 10 localities (24 in the Merriam collection, 32 in the Biological Survey collection):

*North Dakota:* Portland, 18; Pembina, 2.

*South Dakota:* Fort Sisseton, 2; Travere, 2.

*Minnesota:* Browns Valley, 5; Elk River, 5; Minneapolis, 7; Hinckley, 10; Bridgman, 4.

*Manitoba:* Carberry, 1.

### Evotomys gapperi galei Merriam.

*Evotomys galei* Merriam, North American Fauna, No. 4, p. 23, pl. ii, figure 3, October 8, 1890.

*Type locality.*—Ward,* Boulder County, Colorado. Altitude 9500 feet (2900 meters).

*The type locality was given in the original description as Gold Hill. It has since been learned that the type specimen came from Ward, about 6 miles above Gold Hill.

*Geographic distribution.*—Boreal zone of mountains of Colorado and northward along eastern ranges of Rocky Mountains to northern Montana.

*General characters.*—Similar to *E. gapperi*, with slightly longer tail and lighter coloration, skull developing prominent superciliary ridges with age.

*Color.*—*Winter pelage:* dorsal stripe sharply defined, reddish chestnut, with a few black hairs; sides and face buffy gray; belly and feet whitish or yellowish gray; tail bicolor, whitish below, blackish or buffy gray above, except the black upper part of pencil; ears faintly tinged with color of back. In spring and early summer pelage the dorsal stripe darkens to warm hazel and the sides to rich buffy gray. *Full summer pelage:* dorsal stripe chestnut, slightly darkened with black hairs; sides and face clearer gray than in winter; feet gray. *Young*, in August: darker than the adults, with ears strongly tipped with chestnut; feet dusky and tail not sharply bicolor; spots covering side glands in old males whitish or gray.

*Cranial characters.*—Skull of adult narrower than that of *gapperi*, sharply concave interorbitally, with prominent superciliary ridges; zygomatic arches not abruptly spreading; audital bullæ small and globose; palate straight-edged or rarely with a slight central projection.

*Measurements.*—Average of 6 adults from Longs Peak, measured in the flesh by Edward A. Preble: total length, 145; tail vertebræ, 43.6; hind foot, 18.2; tail, 30 per cent. of total length. One adult ♂ topotype, No. 74076: 146; 40; 18. *Skull* of adult topotype, No. 74076: basal length, 22.2; nasals, 6.5; zygomatic breadth, 13; mastoid breadth, 11; alveolar length of upper molar series, 5.

*General remarks.*—Apparently *galei* branches off from *gapperi* along the east base of the Canadian Rockies and extends southward in a frequently interrupted line, following the eastern ranges of the Rocky Mountains to Colorado. Specimens from St. Marys Lake, Summit, and Java, in northwestern Montana, except for slightly smaller size, are identical with *galei*. Specimens from Silverton and Crystal Lake, Colorado, are not typical, but the difference is not uniform and may be in part due to age and season. A badly mutilated skin in the National Museum from the Uinta Mountains, Wyoming, ought on geographic grounds to belong to this species. Four not fully adult specimens from the Bighorn Mountains, Wyoming, agree better with *galei* than with any other species. A good series from the Big Snowy Mountains, Montana, does not agree with *gapperi*, *galei*, or *saturatus*, but, as the degree of difference is too slight to warrant a new name, they are referred to *galei*.

*Specimens examined.*—Total number, 81, from 12 localities:

*Colorado:* Ward, 8; Gold Hill, 2; Longs Peak, 6; Silverton, 8; Crystal Lake, 1.

*Wyoming:* Bighorn Mountains, 4.

*Montana:* St. Marys Lake, 15; Java, 2; Summit, 4; Big Snowy Mountains, 25; Red Lodge, 2; Beartooth Mountains, 4.

**Evotomys gapperi saturatus** Rhoads.

*Evotomys gapperi saturatus** Rhoads, Proc. Acad. Nat. Sci., Phila., p. 284, October, 1894.

*Type locality.*—Nelson, B. C., on the Kootenay River, 30 miles north of the Washington line.

*Geographic distribution.*—The Blue Mountains of Oregon, mountains of northern Idaho, and northward into British Columbia to Cariboo Lake.

*General characters.*—Larger and longer tailed than *E. gapperi*, with larger ears and stouter hind feet; spot covering side glands conspicuous in all of the 11 adult males.

*Color.*—Dorsal stripe bright and rather light reddish chestnut, closely matching that of *E. gapperi* in specimens from Emsdale, Ontario, and western New York, except that it begins farther behind the eyes; sides, face, and lower rump dark gray, with less ochraceous wash than in *gapperi;* belly washed with almost pure white. Sixteen out of the twenty-four specimens from Nelson have a pure white throat patch extending from lower lip nearly to breast. Ears large, protruding well out of fur, slightly rufous-tipped; feet gray; tail indistinctly bicolor, light gray below, dark gray above.

*Cranial characters.*—Skull, compared with that of *gapperi*, larger, wider, and more angular; pterygoids longer and slenderer; audital bullæ slightly larger; premaxillæ projecting slightly back of truncate posterior end of the nasals; palatine bones U-shaped, with straight posterior margin; front of upper incisors pale lemon yellow.

*Measurements.*—Average of 15 adults measured in the flesh by collector: total length, 149; tail vertebræ, 45; hind foot, 18.2. *Skull* of an average sized adult, No. 66606: basal length, 22.3; nasals, 6.5; zygomatic breadth, 13.5; mastoid breadth, 11.2; alveolar length of upper molar series, 5.

*General remarks.*—Mr. S. N. Rhoads described this subspecies from a single specimen caught August 17, 1892, near the town of Nelson. The animal inhabits a large area of country, and, since the original description gives none of the important characters that distinguish it from neighboring species, the above description has been drawn up from a series of 24 good specimens collected by J. Alden Loring, August 20–28, at Silver King mine, six miles south of Nelson. I have not seen the type of *saturatus*, but assume the present series to be typical.

The species is distinguished from *E. mazama* by a darker dorsal area, shorter tail, more arched skull, straight posterior edge of palate, slenderer, less prominent pterygoids, smaller audital bullæ, and paler incisors. In external characters it resembles *E. idahoensis*, from which it differs in the broad, angular skull, narrower interpterygoid fossa, and in minor details. With the dark-colored *E. occidentalis* it needs no comparison.

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*The name *saturatus*, in suggesting a dark-colored animal, is misleading. The species is scarcely darker than *gapperi* and much lighter colored than *obscurus, californicus, occidentalis, wrangeli, dawsoni*, or *carolinensis*.

*Specimens examined.*—Total number, 71, from 14 localities.

*British Columbia:* Nelson, 24; Sicamous, 1; Glacier, 1.

*Washington:* Colville, 1.

*Idaho:* Mission, 1; Kingston, 1; Mullan, 6; Craig Mountains, 4.

*Montana:* Thompson Pass, 5; Prospect Creek, 3.

*Oregon:* Blue Mountains (10 miles north of Harney), 8; Strawberry Butte, 3; Elgin, 8; Kamela, 5.

### Evotomys brevicaudus Merriam.

*Evotomys gapperi brevicaudus* Merriam, North American Fauna, No. 5, p. 119, pl. iii, figs. 7 and 8, July 30, 1891.

*Type locality.*—Custer, Black Hills, South Dakota. Exact locality, 3 miles north of the town; altitude about 6000 feet [1830 meters].

*Geographic distribution.*—Boreal cap of Black Hills in South Dakota.

*General characters.*—As large as *E. gapperi*, with rather larger hind foot and much shorter tail; coloration in summer pelage paler. Larger than *E. loringi*, with relatively shorter tail.

*Color.*—*Summer pelage:* Similar to *loringi*, but paler, with black hairs more conspicuous; sides ash gray, strongly suffused with buffy; belly creamy white; side spots dusky gray. In the type and topotype the tail, feet, and ears are discolored by corrosive sublimate.

*Cranial characters.*—Skull similar to that of *gapperi* in large size and broad brain case; zygomatic arches low and flaring out, so that the inner instead of the outer side shows in a top view; audital bullæ as large as in *gapperi*, but less rounded; pterygoids wide, flat, and close together; molars large; incisors slender and pale yellow, palate approximately straight-edged.

*Measurements.*—Type specimen measured in flesh by Vernon Bailey: total length, 125; tail vertebræ, 31; hind foot, 19. A topotype (No. 4506) measures 130; 32; 19. *Skull* of type: basal length, 21.2; nasals, 6.6; zygomatic breadth, 12.5; mastoid breadth, 11.3; alveolar length of upper molar series, 5.4. Skull of more fully adult topotype: basal length, 21.8; nasals, 7; zygomatic breadth, 12.8; mastoid width, 11; alveolar length of molar series, 5.3.

*General remarks.*—The two original specimens, collected July 18 and 21, 1888, show only the perfect summer pelage. The skulls show that the animals were not fully adult, though probably full grown. Though based on so scanty material, the characters distinguishing the species are fairly pronounced. Its range is isolated, and widely separated from that of any other members of the genus by open prairie country and a wide belt of the Transition zone. There seems to be no valid reason for considering it a subspecies. It is even difficult to decide to which form it is most nearly related.

*Specimens examined.*—Total number, 3, from two localities in the Black Hills.

*South Dakota:* Custer, 2; Deadwood, 1.

### Evotomys carolinensis Merriam.

*Evotomys carolinensis* Merriam, Am. Jour. Sci., vol. XXXVI, p. 460, Dec., 1888.

*Type locality.*—Roan Mountain, North Carolina; altitude 6000 feet [1830 meters].

*Geographic distribution.*—Boreal parts of Alleghany Mountains of North Carolina, Tennessee, and West Virginia.

*General characters.*—Size large; hind foot, 20 mm. or more; tail long; color dark and rich; molars larger than in any other American species.*

*Color.—Full summer pelage:* back dark chestnut, blending gradually with bistre of sides, face, and rump; darkened everywhere above with numerous black hairs; belly varying from white to buffy-ochraceous, the under fur showing through; fur covering side glands of male forming an inconspicuous spot slightly darker than surrounding fur; ears dusky; feet grayish brown; tail indistinctly bicolor, gray below, blackish above, and all round at tip. *Winter pelage* (February, March, and April specimens): paler and brighter; back brighter ferruginous, belly averaging whiter; sides buffy-ochraceous instead of bistre; ears slightly rufous tipped. *Young* darker than adults.

*Cranial characters.*—Skull, compared with that of *E. gapperi*, larger, wider, and more angular, with audital bullæ relatively smaller, flatter, and more elongated; basioccipital wider between bullæ; molars larger and especially wider and heavier; enamel surface of upper incisors darker yellow.

*Measurements.*—Average of 4 adults (2 ♂ and 2 ♀) from type locality, measured in flesh by Dr. C. Hart Merriam: total length, 149; tail vertebræ, 44; hind foot, 20.2. *Skull* (a fully adult ♀, No. 73115): basal length, 23.5; nasals, 7.5; zygomatic breadth, 14.4; mastoid breadth, 12; alveolar length of upper molar series, 6.

*General remarks.—Evotomys carolinensis* is readily distinguished from all other eastern forms by its larger size and darker coloration. Specimens in the same pelage should be used for comparison, as the lightest phase of winter pelage in *carolinensis* matches the darkest summer phase of *gapperi*.

*Specimens examined.*—Total number, 87, from 3 localities.

*North Carolina:* Roan Mountain, 47; Highlands, 2.

*West Virginia:* Travellers Repose, Pocahontas County, 38.

### Evotomys ungava sp. nov.

*Type* from Fort Chimo, Ungava. No. $\frac{5471}{6135}$, ♂ ad., Merriam Coll. Collected by L. M. Turner, May 12, 1883. Original number, 317.

*General characters.*—Size about as in *gapperi;* tail and feet slender; ears very small, not projecting beyond fur; colors dull; tail bicolor; skull slender; rostrum not decurved.

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*Only exceeded in size by the molars of *E. rufocanus* of Europe.

*Color* [type specimen skinned out of alcohol].—Dorsal area not sharply defined, dull brownish chestnut; sides and face buffy gray, finely lined with blackish hairs; belly dark plumbeous, heavily washed with buffy; ears tipped with color of back; feet dusky gray; tail indistinctly bicolor, soiled buffy below, brownish above; sides of nose whitish; a small white spot under lower lip.

*Cranial characters.*—Skull, compared with that of *gapperi*, long and slender; brain case narrower; zygomata less spreading; rostrum longer and straighter; audital bullæ longer, flatter, and less rounded; both upper and lower incisors slenderer; lateral bridges of palate incomplete; molars as in *gapperi*, except the first upper, in which the edges of the first and second inner salient loops meet and coalesce, inclosing a dentine core.

*Measurements.*—Type specimen, measured from alcohol by Dr. C. Hart Merriam: total length, 134; tail vertebræ, 39; hind foot, 19. *Skull:* basal length, 22.8; nasals, 7; zygomatic breadth, 13.5; mastoid breadth, 11; alveolar length of upper molar series, 5.

*General remarks.*—The type and only specimen was skinned and made up from alcohol, and doubtless the colors have changed somewhat; but the small ears, slender feet and tail, and distinctive cranial characters mark the species as entirely distinct from any other known form. In geographic position it comes nearest to *E. proteus* Bangs, of Hamilton Inlet, Labrador, but in characters differs more widely from that species than from the more distant *gapperi*.

In a letter to Dr. Merriam, Mr. Turner reported the species as abundant at Fort Chimo.

### Evotomys idahoensis Merriam.

*Evotomys idahoensis* Merriam, North American Fauna No. 5, p. 66, July 30, 1891.

*Type locality.*—Sawtooth or Alturus Lake, east foot of Sawtooth Mountains, Idaho.

*Geographic range.*—Mountains of south central Idaho, between Snake River and the Salmon.

*General characters.*—Size medium, larger than *gapperi;* conspicuously different in color from any known species, the sides being clear gray; tail longer than in *gapperi* or *galei;* ears not tipped with rufous; skull narrow and smoothly rounded.

*Color.*—Dorsal stripe well defined, extending from in front of ears to rump, pale hazel, somewhat darkened with black-tipped hairs; face, sides, and rump clear ash gray; belly washed with white or whitish; ears sooty gray without rufous tips; feet gray; tail bicolor, gray below, blackish above. Side glands scarcely visible in the specimens at hand.

*Cranial characters.*—Skull long, narrow, and smooth, convex interorbitally; zygomatic arches very oblique; rostrum long; posterior margin of palate straight; pterygoids long and slender, longer, straighter, and

farther apart than in *E. saturatus;* audital bullæ long and laterally appressed; basioccipital wide between bullæ; incisors pale yellow.

*Measurements.*—Type, measured in flesh by Dr. C. Hart Merriam: total length, 153; tail vertebræ, 48; hind foot, 20. Average of 4 adults from type locality measured by A. H. Howell: 148; 44; 20.2. *Skull* of type: basal length, 23.5; nasals, 8; zygomatic breadth, 13.3; mastoid breadth, 11.6; alveolar length of upper molar series, 5.4.

*Remarks.*—Three specimens from the Salmon River Mts. differ slightly from the type, but the difference may be individual. Specimens of *E. saturatus* from the Craig Mts., Idaho, and of *E. galei* from the Beartooth Mts., Montana, though geographically near, show no close affinity with *E. idahoensis.*

*Specimens examined.*—Total number, 15, from the two following localities:

*Idaho:* Sawtooth or Alturas Lake, 12; Salmon River Mts., 3.

### Evotomys mazama Merriam.

*Evotomys mazama* Merriam, Proc. Biol. Soc. Wash., vol. XI, p. 71, April 21, 1897.

*Type locality.*—Crater Lake, Mt. Mazama, Oregon; altitude, 7000 feet [2130 meters].

*Geographic distribution.*—Crest of the Cascade Mountains in Oregon.

*General characters.*—Large, long tailed, and bright colored; ears not rufous; skull broad and angular; side glands conspicuous in all of the adult males.

*Color.*—Dorsal stripe extending from in front of ears to base of tail, cinnamon rufous or hazel, shading gradually into buffy gray of sides and face; belly washed with buffy white; oval spot covering side glands slaty gray, more or less frosted with white-tipped hairs; feet grayish white; tail sharply bicolor, whitish below, blackish above.

*Cranial characters.*—Skull angular, with unusually flat top, long, straight rostrum, and abruptly spreading zygomata; audital bullæ large; pterygoids prominent, wide, and inflated at the tips; palatines rounded anteriorly, with a median posterior projection; enamel surface of incisors orange.

*Measurements.*—Average of 4 adult males from type locality measured by Dr. C. Hart Merriam: total length, 157; tail vertebræ, 52; hind foot, 18.7. *Skull* of type: basal length, 23.3; nasals, 7.2; zygomatic breadth, 14.2; mastoid breadth, 12.4; alveolar length of upper molar series, 5.

*Remarks.*—*Evotomys mazama* differs from *E. saturatus* in slightly larger size and longer tail; in yellower, less sharply outlined dorsal stripe; no tendency to white throat patch; in more angular skull with larger audital bullæ and pterygoids; in orange instead of pale yellowish enamel of upper incisors, and most conspicuously in form of palatine bones. From the dark colored coast species it differs conspicuously in color, but with *E. obscurus* it needs careful comparison.

*Specimens examined.*—Total number, 19, from 2 localities:

*Oregon:* Crater Lake, 16; Mount Hood, 3.

### Evotomys obscurus Merriam.

*Evotomys obscurus* Merriam, Proc. Biol. Soc. Wash., vol. XI, p. 72, April 21, 1897.

*Type locality.*—Prospect, Upper Rogue River Valley, Oregon.

*Geographic distribution.*—West slope of the southern Cascade Range and northern Sierra Nevada in southern Oregon and northern California.

*General characters.*—A rather large, grayish species, with small gray ears and indistinct markings; side glands inconspicuous, but easily discovered on blowing apart the fur. The characters given are mainly those distinguishing the species from *E. mazama*.

*Color.*—Upper parts olive gray, with an ill defined dorsal area of cinnamon rufous, obscured by black hairs; lower part of sides and face clear gray; belly washed with dull buff; ears dusky, not rufous tipped; feet dusky gray; tail distinctly bicolor in specimens from the type locality, more sharply bicolor in specimens from Carberry Ranch, California.

*Cranial characters.*—Skull less angular and abruptly spreading than that of *E. mazama* and with a more arched dorsal line; rostrum short, decurved, with lower outline well arched; incisive foramina short and wide; palatines and audital bullæ as in *E. mazama*.

*Measurements.*—Type specimen, measured in the flesh by E. A. Preble: total length, 155; tail vertebræ, 47; hind foot, 17. *Skull* of type: basal length (basion to gnathion), 21.8; zygomatic breadth, 13.3; mastoid breadth, 11.5; alveolar length of molar series, 4.5.

*Remarks.*—The series of specimens includes both young and adult individuals collected in May, August, September, and December, but apparently none in full winter pelage. In both geographic position and specific characters this species lies between *E. mazama* of the summit of the Cascades and *E. californicus* of the coast region. On the side of Mount Mazama it almost or quite meets the range of *E. mazama*, with which none of the specimens show evidence of intergradation. Specimens from Carberry Ranch show a slight approach toward *californicus*, and future collections may prove *obscurus* to be a lighter-colored, interior form of that species.

*Specimens examined.*—Total number, 10, from 5 localities:

*Oregon:* Prospect, 4; west side of Crater Lake, 1; Grand Pass, 1; Siskiyou, 1.

*California:* Carberry Ranch (near Montgomery Creek), Shasta County, 3.

### Evotomys californicus Merriam.

*Evotomys californicus* Merriam, North American Fauna No. 4, p. 26, pl. ii, fig. 2, Oct. 8, 1890.

*Type locality.*—Eureka, Humboldt Co., California.

*Geographic distribution.*—Coast strip of Oregon and northern California.

*General characters.*—One of the largest, darkest, and longest-tailed species in North America. Dorsal area ill defined; ears small, and in May and

June specimens almost naked, not rufous; lateral glands well defined in half of the specimens examined, conspicuous in the type and two other old males.

*Color.*—Upper parts dark bister or sepia, becoming dusky on rump and dull, dark chestnut on back; dorsal area indistinct and shading gradually into color of sides; oval patches of dense fur covering side glands plumbeous in slight contrast to surrounding fur; belly pale buffy or soiled whitish, darkened by the plumbeous under fur; tail sharply bicolor, blackish above and at tip all round, whitish beneath; feet whitish or but slightly dusky; ears dusky, with no rufous or light-colored hairs.

*Cranial and dental characters.*—Skull thick and heavy, with short, stout decurved rostrum; audital bullæ and pterygoids both relatively and actually larger than in any other species; palatines usually triangular in outline instead of U-shaped, as in other species, and with a triple or single pointed posterior projection; zygomatic arches bent well down and not abruptly spreading; molars wide and heavy; enamel folds crowded longitudinally and irregular; posterior upper molar short, with terminal loop very small or, in 4 specimens out of 6, absent.

*Measurements.*—Type, measured in flesh by T. S. Palmer: total length, 161; tail vertebræ, 50; hind foot, 21. An adult ♂ from Yaquina Bay, Oregon, measured by B. J. Bretherton: total length, 163; tail vertebræ, 55; hind foot, 20. *Skull:* basal length, 22.8; nasals, 7.5; zygomatic breadth, 14; mastoid width, 12.3; alveolar length of upper molar series, 5.3.

*General remarks.*—In geographic position this species lies nearest to *E. obscurus* on the east and to *E. occidentalis* on the north, and with these species only does it need comparison. The darker color, larger size, and longer tail distinguish it at a glance from *E. obscurus* without reference to the numerous cranial differences. Specimens from localities away from the coast (Willetts and Sherwoods, near the center of Mendocino County, California) are somewhat smaller and lighter colored than the type, which suggests that the species may grade into *E. obscurus*, though at present no intermediate specimens are available. *E. californicus* is readily distinguished from its northern neighbor, *E. occidentalis*, by light feet and belly, bicolor tail, larger size, and blacker coloration, in contradistinction to the sooty feet and belly, concolor tail, smaller size, and more rufous back of *occidentalis*.

*Specimens examined.*—Total number, 9, from the 5 following localities:
*California:* Eureka, 1; Willetts, Mendocino County, 3; Sherwoods, 3.
*Oregon:* Yaquina Bay, 1; Oregon City, 1.

### Evotomys occidentalis Merriam.

*Evotomys occidentalis* Merriam, North American Fauna, No. 4, p. 25, pl. ii, fig. 1, Oct. 8, 1890.
*Evotomys pygmæus* Rhoads, Proc. Phila. Acad. Nat. Sci., p. 284, October, 1894.

*Type locality.*—Aberdeen, Washington.

*Geographic distribution.*—Coast and Puget Sound region of Washington and southern British Columbia.

*General characters.*—Size considerably less than *californicus;* dorsal area indistinct; tail long and slender; concolor ears nearly naked, not large, but conspicuous above the short summer fur; tail and feet scantily haired in summer specimens; lateral glands conspicuous in 2 out of 3 adults from Aberdeen.

*Color.*—August specimens from Aberdeen: dorsal area ill defined, sometimes indistinct, varying from dull burnt umber to dark chestnut, darkened by numerous black-tipped hairs; sides dusky gray with a buffy suffusion; an oval patch of darker sooty gray covering side glands in the type and two other specimens; tail almost concolor, blackish; feet dusky or blackish; belly salmon-buff, the dusky under fur showing through; nose blackish.

*Cranial characters.*—Skull thin and light, without prominent angles and processes, relatively narrow and slender, with gently arching zygomata; anterior part of palate from molars to incisors well arched; audital bullæ much inflated, crowding close together over basioccipital; pterygoids flat, thin, and much perforated at base; palatines with a rounded or notched posterior projection; molars normal; anterior surface of upper incisors orange, in strong contrast to the pale yellowish of those of *E. saturatus.*

*Measurements.*—Type, measured in the flesh by T. S. Palmer, ♂ ad.: total length, 145; tail vertebræ, 45; hind foot, 18. Average of 3 adults from type locality: 146; 47; 18.3. *Skull* of type: basal length, 22; nasals, 7; zygomatic breadth, 12.5; mastoid breadth, 11; alveolar length of molar series, 4.7.

*Remarks.*—This species is peculiar to the low, moist coast and sound region—the 'Webfoot country'—where its dark color blends with the shadows of dense vegetation. In general the color is nearly as dark as that of *E. californicus*, but the rich brown on the back, the concolor, dusky tail, and dusky feet are the characters most sharply distinguishing it from neighboring species. There is a possibility of intergradation with *E. californicus* on the south, as well as with *E. saturatus* of the mountains farther east. Specimens from Port Moody, B. C., while agreeing closely with the type in all external characters, show a slight departure in cranial characters in the more angular skull, paler incisors, and smaller audital bullæ. A half-grown specimen from the head of Cascade River is slightly lighter and brighter colored than specimens of the same age from the type locality.

*Evotomys pygmæus* Rhoads, from the mouth of the Nisqually River, Washington, is based on small size, and was described as the smallest species of the genus, measuring 120; 34; 16. In a series of 9 specimens from Tenino (16 miles SW. of the mouth of Nisqualla River), adult specimens, measured in the flesh by C. P. Streator, range from 136; 40; 18 to 155; 49; 18. Two not fully adult specimens from Steilacoom (8 miles NE. of the mouth of Nisqually River) measure 125; 36; 16.5 and 128; 39; 17. In brief, specimens from Tenino and Steilacoom localities close by and on both sides of the type locality of '*pygmæus*' agree within the limits of individual and slight seasonal variation in size, color, and cranial characters with specimens from Aberdeen, the type locality of *E. occiden-*

*talis.* It is evident, therefore, that *E. pygmæus* Rhoads is the young of *E. occidentalis.*

*Specimens examined.*—Total number, 19, from 5 localities.

*Washington:* Aberdeen, 6; Tenino, 10; Steilacoom, 2; head of Cascade River, 1 im.

*British Columbia:* Port Moody, 1.

### Evotomys nivarius* sp. nov.

*Type* from Olympic Mountains, Washington, at altitude of 4000 feet [1220 meters], on NW. slope of Mt. Ellinor. No. 66203, ♀ ad., U. S. Nat. Mus., Biological Survey Coll. Collected July 9, 1894, by C. P. Streator. Collector's number, 4025.

*Geographic distribution.*—Mt. Ellinor and probably other high peaks in the Olympic Mountains.

*General characters.*—Size and proportions about as in *E. occidentalis,* but color lighter and brighter, with skull more angular. Fur long and lax; ears small and scantily haired; tail and feet slender, well covered with short hair.

*Color.*—Dorsal stripe well defined, extending from anterior base of ears to base of tail, dull light chestnut; sides dark gray with little buffy suffusion; belly thinly washed with soiled whitish, darkened by plumbeous under fur; postauricular spots whitish; ears dusky; tail distinctly bicolor, soiled whitish below, dusky above; feet dirty white.

*Cranial characters.*—Skull short, wide, angular, and flat; zygomatic process of maxilla projecting at right angles to axis of skull; zygomatic process of squamosal spreading; frontals deeply concave postorbitally; lateral ridges of frontals and parietals prominent; audital bullæ as large as in *E. occidentalis;* pterygoids slender; palatines short, anterior edge truncate or rounded, posterior edge straight; tooth pattern different in each of the three specimens; incisors yellow like those of *E. occidentalis.*

*Measurements.*—Average of 3 adult females from type locality, measured in the flesh by C. P. Streator: total length, 150; tail vertebræ, 50; hind foot, 18. *Skull* of type: basal length, 21; zygomatic breadth, 13; nasals, 6.5; mastoid breadth, 11.5; alveolar length of upper molar series, 5.

*Remarks.*—The specimens from the type locality were caught on July 9, at the edge of an alpine lake, at about 4000 feet altitude. At that date Mr. Streator roports about one-third of the lake covered with ice and snow from the previous winter, while deep snow drifts lay on most of the neighboring slope. Ice formed over the water almost every night during his stay, from July 8 to 11. The snow banks do not entirely leave Mt. Ellinor during the summer. At this altitude the timber is smaller and more scattered and the undergrowth less dense than lower down.

The species shows no close relationship with any other, except *occidentalis.* The types of these two are widely different, but specimens from

* The name *nivarius* seems appropriate to this alpine species, found in close proximity to snow banks that never melt.

the vicinity of Lake Cushman, at the east base of the Olympic Mountains, show either that the two species meet there or that intergrades occur. A more complete series of specimens is needed to prove intergradation, and until such a series is obtained *E. nivarius* may stand as a full species.

*Specimens examined.*—Total number, 6, from three localities.

*Washington:* Mt. Ellinor, 3; Lake Cushman, 2; Skokomish River (10 miles above Lake Cushman), 1.

[The account of the following species is contributed by Outram Bangs.]

"**Evotomys proteus** sp. nov.

"*Type* from Hamilton Inlet, Labrador. No. 4081, ♀ old adult, coll. of E. A. and O. Bangs. Collected Aug. 27, 1895, by C. H. Goldthwaite.

"*General characters.*—Size largest of the northeastern forms; ear and hind foot large; colors very variable; usual coloring of adults yellowish or grayish, with a darker (often sooty) dorsal stripe. Red-backed individuals are in a small minority, and even these have the face gray; feet and tail more hairy than in *gapperi* or *ochraceus;* skull large and angular, with deep interorbital constriction, behind which the brain case expands more squarely than in either *gapperi* or *ochraceus*, with more strongly marked spur-like process of squamosal.

"*Color.*—The color of this mouse varies enormously. The type (representing the color phase that seems to be most usual): sides, flanks, cheeks, and face smoke gray, somewhat shaded with yellowish and drab, darkening on back into a broad dorsal stripe of sepia, and paling off on under parts to light smoke gray; feet and hands dull gray; tail indistinctly bicolor, dusky above, dull gray below, hairy. No. 4088 has the whole upper parts, back, and sides dull yellowish, the dorsal stripe slightly darker. No. 4054 has the sides darker yellowish brown and the dorsal stripe bright chestnut, while No. 4139 is slaty all over, slightly paler below, and darker dorsally. Every degree of intermediate coloration can be found between these extremes.

"*Cranial characters.*—The skull is larger than that of either *gapperi* or *ochraceus*, the brain case more angular, the interorbital constriction deeper, and the forward spur-like process of squamosal much more strongly marked. The dentition does not appear to differ materially from that of either *gapperi* or *ochraceus*.

"*Measurements* (taken in the flesh by collector).—The type, ♀ old adult: total length, 171; tail vertebræ, 53; hind foot, 21; ear from notch, 17. Average of the 20 largest adult specimens: total length, 161.8; tail vertebræ, 48.83; hind foot, 20.47; ear from notch, 17.75."

## EXPLANATION OF PLATE III.

FIG. 1. *Evotomys rutilus* (Pallas).
ad., Syd Varanger, Finmark, Norway, No. 6555, Merriam Coll.
1, top of skull; 1*a*, palate region.

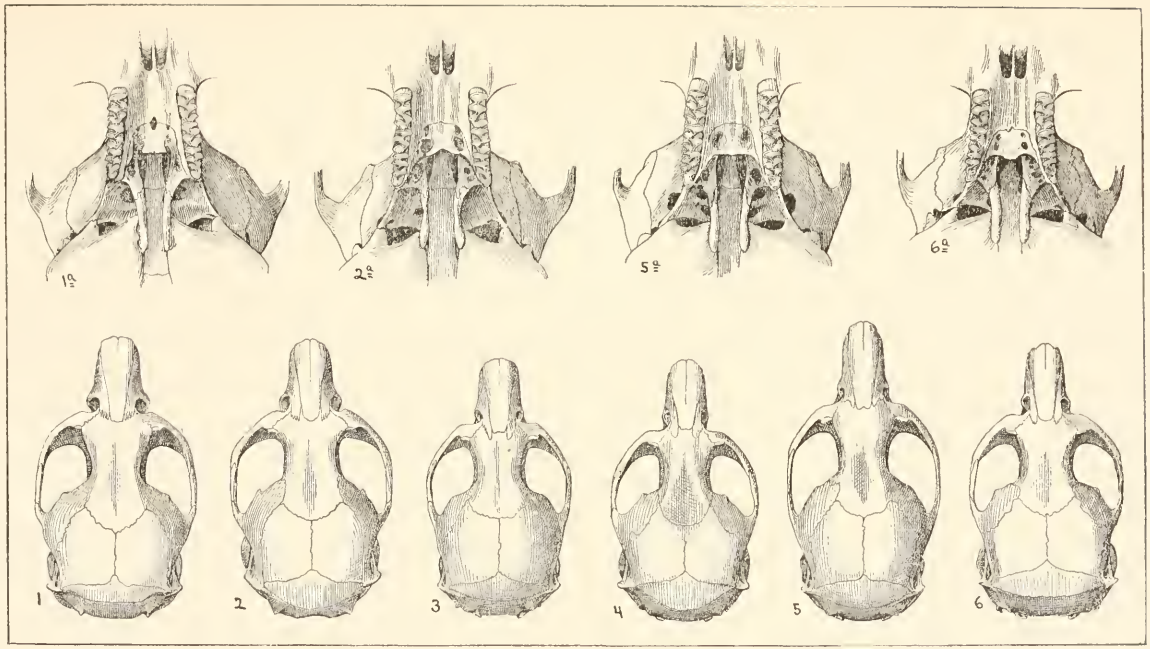
2. *Evotomys dawsoni* Merriam.
♂ ad., Yakutat, Alaska, No. 73566, U. S. Nat. Mus., Biological Survey Coll.
2, top of skull; 2*a*, palate region.

3. *Evotomys loringi* subsp. nov.
♂ ad. (type), Portland, Traill Co., N. Dakota, No. 75795, U. S. Nat. Mus., Biological Survey Coll.
3, top of skull.

4. *Evotomys nivarius* sp. nov.
♀ ad. (type), Mt. Ellinor, Olympic Mts., Washington, No. 66203, U. S. Nat. Mus., Biological Survey Coll.
4, top of skull.

5. *Evotomys wrangeli* sp. nov.
5. ♀ ad. (type), Wrangel Island, Alaska, No. 74724, U. S. Nat. Mus., Biological Survey Coll. (5*a*, same locality; No. 74730.)
5, top of skull; 5*a*, palate region.

6. *Evotomys mazama* Merriam.
6. ♂ ad. (type), Crater Lake, Oregon, No. 79913, U. S. Nat. Mus., Biological Survey Coll. (6*a* ♂, same locality; No. 79915.)
6, top of skull; 6*a*, palate region.




1. EVOTOMYS RUTILUS
2. E. DAWSONI
3. E. LORINGI
4. E. NIVARIUS
5. E. WRANGELI
6. E. MAZAMA

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTION OF A NEW BAT FROM MARGARITA ISLAND, VENEZUELA.

BY GERRIT S. MILLER, Jr.

Through the kindness of Mr. F. W. True, curator of mammals in the U. S. National Museum, I have been permitted to examine the bats collected by Lieut. Wirt Robinson on Margarita Island, Venezuela, in July, 1895. Among them is a specimen of *Rhogeëssa* which differs considerably from any of the Mexican species of the genus, and without doubt represents an undescribed insular form. It may stand as:

**Rhogeessa minutilla** sp. nov.

*Vesperugo parvulus* Robinson, Proc. U. S. National Museum, XVIII, p. 651, 1896.

*Type* from Margarita Island, Venezuela. No. 63216, ♂ ad., U. S. National Museum. Collected July 8, 1895, by Lieut. Wirt Robinson. Collector's number, 463.

*General characters.*—Most like *Rhogeëssa tumida* H. Allen, but much smaller.

*Color.*—Fur everywhere light yellowish brown to base, the hairs on the back tipped with chestnut; ears and membranes in dry specimen dark brown.

*Skull and teeth.*—The skull of *Rhogeëssa minutilla* is smaller than that of *R. tumida*, and apparently has a narrower brain case; but as it is injured, the cranial characters cannot be determined with certainty. Teeth essentially as in *R. tumida*.

*Measurements.*—Total length, about 65; tail vertebræ, 25; tibia, 11; foot, 5; forearm, 25; thumb, 3.6; longest finger, 51; ear from meatus, 11.8; width of ear, 8; tragus, 6.4; greatest length of skull, 11.8; upper tooth row, 5; lower tooth row, 5.6; mandible, 9.

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# DESCRIPTION OF A NEW VOLE FROM KASHMIR.

BY GERRIT S. MILLER, Jr.

Mr. Oldfield Thomas, of the British Museum, has recently sent me for determination a vole collected by Dr. J. E. T. Aitchison, F. R. S., at Gulmerg, Kashmir. The specimen proves to be a *Microtus* of the subgenus *Hyperacrius*.* It differs from *Microtus fertilis* (True),† the only other known member of the subgenus, in several important characters, and evidently represents a new species, which may stand as:

**Microtus aitchisoni** ‡ sp. nov.

*Type* from Gulmerg, Kashmir, altitude 9000 feet. Adult ♂ (in alcohol), British Museum collection (not registered). Collected by Dr. J. E. T. Aitchison.

*General characters.*—General appearance much as in *Microtus fertilis* (True), but size considerably larger and color apparently yellower.

*Color.*—Color on back bister slightly darkened with blackish and fading rapidly on sides into light yellowish wood brown of belly; tail obscurely bicolor, dark brown above, light yellowish brown below; feet dusky; whiskers scant and short, the longest reaching about to ears, mixed brown and silvery gray.

*Skull.*—The skull of the type is reduced to fragments, but these indicate that it was considerably larger than that of *M. fertilis*.

*Teeth.*—The teeth of *Microtus aitchisoni* are uniformly much larger than in *M. fertilis*, but the enamel pattern is essentially as in the latter.§

*Measurements.*—Total length, 135; tail vertebræ, 33; hind foot, 19; front foot, 13; ear from meatus, 12; ear from crown, 7.4 (from specimen in alcohol); maxillary tooth row, 7; mandibular tooth row, 6.8.

* See North American Fauna No. 12, p. 54.

† Proc. U. S. National Museum, XVII, p. 10, 1894.

‡ At Mr. Thomas' request, this vole is named after the collector of the type specimen.

§ For figure of enamel pattern of *Microtus fertilis*, see North American Fauna No. 12, p. 55.

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OF THE

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MARINE BIOLOGICAL LABORATORY WOODS HOLE LIBRARY

# DESCRIPTION OF A NEW MUSKRAT FROM THE GREAT DISMAL SWAMP, VIRGINIA.

BY DR. C. HART MERRIAM.

Among the new mammals obtained at Lake Drummond, in the heart of the great Dismal Swamp, is a curious Muskrat. It is by far the handsomest of the three forms thus far recognized in the genus, and differs from them all in color and in the large size of the teeth.

**Fiber macrodon** sp. nov.

*Type* from Lake Drummond, Dismal Swamp, Va. No. 75940, ♀ ad., U. S. Nat. Mus., Biological Survey Coll. Collected Oct. 9, 1895, by Dr. A. K. Fisher. Original No. 1788.

*General characters.*—Similar to *Fiber zebethicus*, but color very much darker; incisor and molar teeth very much larger.

*Color.*—Entire upper parts, abdomen, and spot on chin blackish brown, darkest and richest on back; throat, sides of face, anterior part of breast (to plane of fore legs), and inguinal region soiled whitish or very pale drab, more or less tinged with pale fulvous; long hairs of sides and belly tipped with pale dull fulvous.

*Cranial and dental characters.*—Skull similar to that of *F. zebethicus*, but braincase more elongated posteriorly; squamosal root of zygoma more sloping (not standing out so squarely); incisors heavier (upper ones measuring 7.5 mm. across cutting edges); molars much larger and heavier, the upper series measuring about 16 mm. on crowns.

*Remarks.*—The large teeth and remarkable color of the Lake Drummond Muskrat suffice to distinguish it at a glance. Whether or not there is a seasonal color change cannot be determined from the material at hand.

*Measurements.*—Type specimen: total length, 567; tail vertebræ, 244; hind foot, 80.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTIONS OF A NEW EAGLE FROM ALASKA AND A NEW SQUIRREL FROM LOWER CALIFORNIA.

BY C. H. TOWNSEND.

The following very distinct forms are among the collections contributed by the writer to the U. S. National Museum between 1889 and 1895:

**Haliætus leucocephalus alascanus** new subspecies.

*Subspecific characters.*—Differing from *H. leucocephalus* in size, being considerably larger.

*Habitat.*—Alaska.

*Type.*—♂ (U. S. Nat. Mus. No. 151,567). Unalaska, Aleutian Islands, May 22, 1895. C. H. Townsend.

*Dimensions of Type.*—Wing, 23.75; tail, 11.50; tarsus, 4; culmen, 2.60; depth of bill, 1.50; hind claw, 1.50.

*Comparative Measurements.*

| Locality. | Averages. | Wing. | Tail. | Tarsus. | Bill. | | Claw of hind toe. |
|---|---|---|---|---|---|---|---|
| | | | | | Length. | Depth. | |
| Florida..... | 4 ad. ♂s. | 21.12 | 10.43 | 3.40 | 2.43 | 1.27 | 1.50 |
| Florida and Louisiana..... | 3 " ♀s. | 22.75 | 11.31 | 3.42 | 2.45 | 1.32 | 1.60 |
| Aleutian Islands. | 4 " ♂s. | 23.81 | 11.56 | 4.18 | 2.50 | 1.40 | 1.62 |
| " " | 2 " ♀s. | 24.62 | 12.00 | 3.75 | 2.62 | 1.50 | 1.75 |

In forty specimens examined from localities between Florida and Alaska there is a regular increase in size northward. Eagles from north-

ern States are larger than those from Florida and Louisiana. In addition to the other differences in size, the bill of the Alaskan bird is wider, while the edging to the feathers, especially on the wing coverts, is both lighter and broader. The egg of the northern bird is distinctly larger, the average of sixteen specimens being 73.5 x 57.5 mm., while that of forty-five Florida specimens is 69 x 53.5 mm.

**Sciurus hudsonius mearnsi** new subspecies.

*Sciurus hudsonius californicus* Allen. Bull. Am. Mus. Nat. Hist., III., 1890, pp. 165–167.

This form is characterized by extreme pallor of coloration and by having middle dorsal region tinged pale yellowish instead of reddish, as in specimens from central and northern California. A general hoariness pervades the entire upper surface; under surface pure white, without traces of annulation; under fur light plumbeous throughout. These specimens have a broad black lateral stripe. The ears are conspicuously tufted with long black hairs, while the top of the head is pale grayish instead of blackish, as in specimens from more northerly localities. Tail with lateral hairs very broadly tipped with white; median area of under side whitish gray, of upper side yellowish gray; terminal third black, fringed with white. Fore and hind feet yellowish white. One specimen (No. 18267, U. S. Nat. Mus.) has acquired the post-breeding pelage on the fore but not on the hind feet, the new hair being buff-yellow instead of soiled white. Specimens from the interior region of northern California are much darker, with distinctly more reddish upper tinge and less hoariness, while the under fur is decidedly darker plumbeous. Specimens of *S. hudsonius mogollonensis* and *S. hudsonius fremonti* have a more general reddish suffusion of the upper parts, and in winter much dusky vermiculation of the under surfaces, while the feet are nearly black and the ear tufts less pronounced.

*S. hudsonius mogollonensis* is considerably larger, the hind foot measuring 54 mm. in *mogollonensis* against 51 mm. in *mearnsi;* the skull 51 x 28.7 against 48.8 x 27.6.

*Type* No. $\frac{18266}{25170}$, U. S. Nat. Mus., from San Pedro Martir Mountains, Lower California (altitude about 7,000 feet). Collected in May, 1889, by C. H. Townsend.

Named for Dr. Edgar A. Mearns, U. S. A., Naturalist of the Mexican Boundary Commission of 1892–'94.

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PROCEEDINGS

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BIOLOGICAL LIBRARY NATIONAL MUSEUM

# *LEPUS BAILEYI*, A NEW COTTONTAIL RABBIT FROM WYOMING.

BY C. HART MERRIAM.

In the summer and early autumn of 1893 my assistant, Mr. Vernon Bailey, and I made a biological reconnaissance of the middle part of the State of Wyoming, which we traversed from west to east. On entering the Wind River Basin a short distance south of the town of Lander, the first mammal to attract my attention was a large, pale Cottontail with ears even longer than those of the Arizona Jack Cottontail (*Lepus arizonæ* Allen). The species was new to me, but I became well acquainted with it during the remainder of the season, for throughout our course in the Wind River and Bighorn Basins one or more were seen every day, and not having been disturbed by man they were very tame, often permitting us to pass within 20 feet (7 meters) without taking alarm. When started they usually ran only a short distance and squatted behind a sage brush or greasewood bush, or in the burrow of a prairie dog or badger, with their long ears laid back on the neck. By rushing suddenly toward them several were driven into these burrows. They were most active at dusk, when their large white tails could be seen flashing in various directions. When at rest the tails are lowered and apparently narrowed, so that the gray of the upper surface conceals the white, but the instant the animal starts the tail is raised and bent up on the rump. When partly erected it seems to curve to the left, but when fully up and pressed against the rump it was found to curve to the right (convexity to the left) in seven cases out of eight. In all of these respects it resembles the tail of the

white-tailed ground squirrel of the southern deserts *Ammospermophilus leucurus*).

The new Cottontail, which I take pleasure in naming *Lepus baileyi*, after my companion, Mr. Vernon Bailey, is a northern representative of the *arizonæ* series, with which it agrees in the large size of the ears and audital bullæ. It inhabits the Upper Sonoran and Transition Zones and ranges completely across the lower parts of the Owl Creek Mts., which mountains separate the Wind River Basin from the Bighorn Basin. On the north the species follows the Bighorn Basin into Montana, and on the east it was last killed by us on Crazy Woman Creek, a tributary of Powder River in northeastern Wyoming. Southeast of Powder River it was afterward obtained at Douglas by Mr. J. Alden Loring. In the Wind River Basin we found it in company with the short-eared Cottontail (*Lepus nuttalli*), though the latter seemed to be closely confined to the willow thickets along the streams, while the long-eared species was found everywhere over the sage and sarcobatus plains and on the open deserts.

**Lepus baileyi** sp. nov. Wyoming Cottontail.

*Type* from Spring Creek, east side Bighorn Basin, Wyoming. No. 56016, ♀ ad., U. S. Nat. Mus., Biol. Survey Coll. Collected Sept. 17, 1893, by C. Hart Merriam and Vernon Bailey. Original No. 4372.

*General characters.*—Size large; coloration pale; ears and tail very long. Similar in general appearance to *L. nuttalli*, but paler, with much longer ears and tail.

*Color.*—Upper parts pale pinkish buff, sparingly lined with black hairs; nuchal patch pale fulvous; rump narrowly grayish, lined with black hairs; ears like back, but terminal fourth bordered by black; outer sides of fore and hind legs pale fulvous; fore and hind feet white or whitish, with basal fur on outer side of feet more or less suffused with pale fulvous; pectoral collar (broad and full) and tuft on each side of inguinal region pale buffy fulvous; under parts white; tail white, except a grayish band on dorsal surface.

*Cranial characters.*—Skull similar to that of *L. arizonæ*, but larger and heavier, with decidedly larger teeth. Contrasted with *L. nuttalli* of the same region, the skull as a whole is larger; the audital bullæ very much larger; the postorbital processes larger, broader, and more produced anteriorly.

*Measurements.*—Type specimen: total length, 418; tail vertebræ, 50; hind foot, 100; ear from base, 94. Average of 8 specimens from the Wind River and Bighorn Basins: total length, 404; tail vertebræ, 55; hind foot, 96.

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# THE AFRICAN SWIMMING CRABS OF THE GENUS *CALLINECTES*.*

BY MARY J. RATHBUN.

This paper is supplementary to the one on 'The Genus *Callinectes*,'† since the publication of which the writer has examined the types of a number of species of doubtful position and has been able to correct the synonymy.‡ It becomes necessary to change the name of two species, *larvatus* to *marginatus*, *tumidus* to *exasperatus*, and advisable to consider the subspecies, *tumidus gladiator*, a species. One new species is added, *C. latimanus*.

**Callinectes marginatus** (A. Milne Edwards).

*Neptunus marginatus* A. Milne Edwards, Arch. Mus. Hist. Nat. Paris, X, 318, pl. xxx, fig. 2, 1861. Gabon. Types examined (3 *juv.* ♀).
*Callinectes larvatus* Ordway, Boston Journ. Nat. Hist., VII, 573, 1863. Key West, Tortugas, Bahamas, Haiti.
*Callinectes larvatus* A. Milne Edwards, Crust. Rég. Mex., 225, 1879 (variety of *C. diacanthus*).
*Callinectes africanus* A. Milne Edwards, *op. cit.*, 229, 1879 (variety of *C. diacanthus*). Cape Verde Islands. Types examined.
*Callinectes larvatus*, var. *africanus?* Benedict, Proc. U. S. Nat. Mus., XVI, 1893, 537.

*Distribution.*—African coast: Cape Verde Islands (U. S. Nat. Mus., No. 14880; Paris Mus.); Liberia (Paris Mus.); Beyah River, Elmina, Ashantee (U. S. Nat. Mus., No. 14878); Gaboon (Paris Mus.); St. Paul de Loando (U. S. Nat. Mus., No. 14877). American coast: Florida Keys to Bahia, Brazil.

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† Proc. U. S. Nat. Mus., XVIII, 1895, 349–375, pls. xii–xxviii, 1896.

‡ *C. nitidus* A. Milne Edwards, 1879, is a synonym of *C. arcuatus* Ordway, 1863.

**Callinectes gladiator** Benedict.

*Callinectes tumidus*, var. *gladiator* Benedict, Proc. U. S. Nat. Mus., XVI, 1893, 537.
*Callinectes tumidus gladiator* Rathbun, Proc. U. S. Nat. Mus., XVIII, 1895, 360, 1896.

This form should, I think, be considered a distinct species from *C. exasperatus* (Gerstæcker), 1856* (= *C. tumidus* Ordway, 1863).

*Type specimen*, ♂.—Carapace, exclusive of lateral spines, wider than in *C. exasperatus;* less convex, but more deeply areolated; the branchial region, besides the two distinct areolæ at the inner angle, has outside these areolæ a higher elevation on which the granules are most crowded. Granules scattered on the lateral regions. Intramedial region wider than in *C. exasperatus*, but posteriorly narrower than in *C. marginatus*. Median teeth of the front small, tuberculiform. Lateral teeth gradually increasing in size from the second to the eighth, excepting that the fifth is slightly wider than the sixth; rather long, and distinctly separated, as in *C. marginatus*. Lateral spine nearly three times the length of the preceding tooth. Abdomen most nearly related to that of *C. exasperatus*.

*Additional material.*—To this species may be referred two small females, one in spirit, one dried, which are preserved in the British Museum. They were collected on the west coast of Africa by Mr. John Cranch of the Congo Expedition, 1816. One was labeled by Leach '*Lupa Smythianus*,' but was not described.†

In these specimens the lateral spine is more than three times as long as the preceding tooth; the inner supraorbital fissure is open to the base; the abdomen (of the female) is allied to that of *C. marginatus*, but the fifth segment is longer than the sixth. Specimens, also young, of both sexes, in the Berlin Museum, agree with the above.

*Dimensions.*—Type, immature ♂: Length to median sinus of front, 27.9; to tips of frontal teeth, 28.6; width to tips of spines, 67; to last sinus, 52.3 mm. Immature ♂, Berlin Museum: Length to sinus, 23; to tips of frontal teeth, 23.5; width to tips of spines, 55.5; to last sinus, 42 mm.

*Type locality.*—Beyah River, Elmina, Ashantee; U. S. Eclipse Expedition, 1889 (U. S. Nat. Mus., No. 14879).

*Distribution.*—Liberia (Berlin Mus., No. 2979); Chinchoxo, West Africa (Berlin Mus., No. 5568); West Africa, Congo Expedition (British Mus.).

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* *Lupea exasperata* Gerstæcker, Arch. f. Natur., XXII, pt. 1, 129, 1856. Puerto Cabello, Venezuela. Type examined.

† In Appendix No. IV to 'Narrative of an Expedition to explore the River Zaire, usually called the Congo, in South Africa, in 1816, under the direction of Captain J. K. Tuckey, R. N.,' London, 1818, Leach says, under *Lupa*, "Of this genus three new species were discovered, all of which belong to that section in which the hinder lateral spine of the shell is very much elongated."

**Callinectes bocourti** A. Milne Edwards.

*Callinectes bocourti* A. Milne Edwards, Crust. Rég. Mex., 226, 1879 (variety of *C. diacanthus*). Rivière de Mullins, 20 miles south of Belize, Honduras. Types examined.
*Callinectes cayennensis* A. Milne Edwards, *loc. cit.* (variety of *C. diacanthus*). Cayenne. Types examined.
*Callinectes ? bocourti* Rathbun, *op. cit.*, 360. Not *C. africanus* A. Milne Edwards.

Specimens of *C. bocourti* from British Guiana in the British Museum are labeled "*C. trispinosus* Leach;" so also are specimens of *C. exasperatus* from Jamaica. Probably neither are types, as the locality of *Lupa trispinosa* is not given by Leach.

*Distribution.*—West Africa: Senegal (U. S. Nat. Mus., No. 18735); Liberia (Berlin Mus., No. 3647); Chinchoxo (Berlin Mus., No. 5566). American coast: Honduras to Rio de Janeiro, Brazil.

**Callinectes latimanus** Rathbun, new species.

This species is so closely related to *C. toxotes* Ordway, from the west coast of America, that it may be described by comparison with that species.

Cardiac and inner branchial areolets less elevated. Length of intramedial area about equal to, but not exceeding, its posterior width. Four frontal teeth (fig. 6) less advanced, triangular and subacute instead of rounded or lobiform. Suborbital tooth broader toward the extremity. Antero-lateral teeth shorter, that is, less projecting; margins of second to fifth pairs, inclusive, considerably shorter than their basal width.

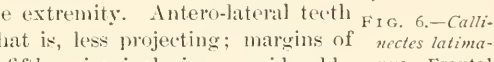

FIG. 6.—*Callinectes latimanus.* Frontal teeth. × ½.

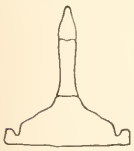

FIG. 7.—*C. latimanus.* Abdomen of male. × ½.

In the abdomen of the male (fig. 7) the third or compound segment is shorter than in *C. toxotes;* the penultimate segment is broader at its proximal end and much constricted at one-third the distance from the proximal end. Sides of terminal segment sinuous. Appendages reaching beyond the tip of the abdomen. In the female the sixth segment is only slightly longer than the fifth.

Meri of chelipeds three-spined on inner margin. Propodus of larger cheliped (fig. 8) with the lower margin very convex below the basal half of the pollex. The fingers are therefore more gaping, the pollex being no wider than in *C. toxotes.*

FIG. 8.—*C. latimanus.* Larger chela. × ½.

*Dimensions.*—♂, No. 19877: Length to median sinus of front, 51 mm.; to tips of frontal teeth, 52.5; width, 115; length of lateral spine, 11.8; of preceding tooth, 4.5.

*Type locality.*—Lagos, Bight of Benin, Guinea; Sir A. Molony, collector. A fine series of this species is preserved in the British Museum (No. 91. 4. 1). One specimen, a male, has been presented to the U. S. National Museum (No. 19877).

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# A REVISION OF THE NOMENCLATURE OF THE BRACHYURA.*

BY MARY J. RATHBUN.

In reviewing the history of the genera of Brachyura † it is evident that many names in current use violate accepted rules of nomenclature. In the following pages especial attention has been paid to generic names, with incidental notes on the names of species. The Code of the American Ornithologists' Union has been observed in making changes. Many of the problems which have arisen are, however, not covered by the provisions of the code, and recourse to the opinions of individuals has been deemed advisable. The writer is under obligation especially to Dr. Walter Faxon and Dr. Theodore Gill not only for advice, but for much practical assistance. Others whose opinions have been consulted on various doubtful points are Drs. J. A. Allen, W. H. Dall, C. Hart Merriam, T. S. Palmer, C. W. Richmond, L. Stejneger, C. W. Stiles, Profs. A. E. Verrill and S. I. Smith, and Messrs. J. E. Benedict, G. S. Miller, Jr., and R. Ridgway. It is but proper to add that no one but the writer is responsible for errors which may appear.

For convenience, the names which it is thought necessary to change are discussed under ten different headings.

1. *Names diverted from their original meaning.*—Canon XXII of the Code of the American Ornithologists' Union says: "In no

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† The term Brachyura is here used as limited by Miers, 1886, with the addition of the Raninidæ, Alcock, 1896.

case should the name [of the genus] be transferred to a group containing none of the species originally included in the genus." The following names have been thus transferred: *Uca*, *Lupa*, *Leptopodia*, *Clorodius*, *Stenocionops*, and *Naxia* of Leach, *Halimus* and *Platyonichus* of Latreille, and *Stenorynchus* Lamarck.

*Uca* was established by Leach in Brewster's Edinburgh Encyclopædia, volume VII, 1814,* for the *Cancer uca* or *uka* Shaw, 1802, which he proposed to call *Uca una*. This is a fiddler crab and not the *Cancer Uca* [*uca*] of Linnæus, 1767, and the *Uca una* of the Maregrave de Liebstad, 1648. Latreille in 1817 (Nouv. Dict. Hist. Nat., XII, 517), rightly considering it a case of mistaken identity, attempted to improve matters by calling Leach's *Uca*, *Gelasimus*, and giving the genus *Uca* to the Linnæan species; but this proceeding is not sanctioned by the rules of today. Before Leach's *Uca* was abandoned its existence was recognized by Say in 1817. *Uca* Latreille may be known as *Ucides*, nov., and its type species as *Ucides cordatus* (Linnæus, 1763) = *Uca una* Maregrave, 1648, which can no longer "be mentioned as a rare instance of one that has been allowed to possess the names by which it was figured and described centuries ago." (Stebbing, Hist. Crust., p. 84.)

In 1814, Edin. Encyc., VII, 390, Leach placed *Cancer pelagicus* Linnæus, 1758, in the genus *Lupa*, and in the same year, in the

*There has been some doubt as to the date of Leach's article, 'Crustaceology.' All the volumes of the Edinburgh Encyclopædia bear the date 1830 on the title page. Desmarest and other writers give the dates 1813-1814 for Leach's article. Dr. Stebbing, who has taken pains to collect evidence on the subject, informs me that volume VII of the Edinburgh Encyclopædia gives no dates subsequent to 1814, the history of Denmark being carried down to January of that year. (See also *Challenger* Amphipoda, vol. I, p. 85, and quotation of Leach on page 155 of this article.) It has been suggested that the original article appeared in 1813 and the Appendix in 1814. I believe, however, that the first two pages of the article were published in 1813 and the remainder, including the Appendix, in 1814. In the Edinburgh edition of vol. VII, but not in the Philadelphia reprint, the signatures of the first half are marked "vol. VII, part I," and of the second half "vol. VII, part II." Part II begins on page 385, or the third page of Leach's article, and the inference is that Part I appeared in 1813 and Part II in 1814. All descriptions of genera and species appear in Part II of the volume, and in this part of the original article appear many references to the Appendix and Index, indicating that the Appendix, although written later than the body of the article, was not published later.

Zoological Miscellany, I, 123, pl. liv, described the new species *Lupa forceps*. That the former should take precedence is proved by the following, which appears in Leach's article 'Annulosa' in the Encyclopædia Britannica, Supplement, vol. I, 1816: "This genus was instituted by Dr. Leach in the Edinburgh Encyclopædia, and has since been given with amended characters in the Zoological Miscellany and in the eleventh volume of the Transactions of the Linnean Society." *Lupa* is a synonym of *Portunus* as restricted by Latreille, 1810 (see page 160). Those who do not admit his restriction must use the name *Lupa* in place of *Neptunus* de Haan, 1833. *Lupella*, nov., is proposed for *Lupa forceps* Leach, or the genus *Lupa* of de Haan, 1833. *Portunus* as used by Leach, 1814, and by succeeding writers may be called *Liocarcinus*, a name proposed by Stimpson, 1871, for a perhaps unnecessary division of that genus.

*Leptopodia* was established by Leach, Edinburgh Encyclopædia, Appendix, 431, 1814, for two species, *Maia phalangium* (Pennant, 1777) Leach [= *Cancer rostratus* Linnæus, 1761 = *Inachus longirostris* Fabricius (sp. 1775), type examined = *Macropodia longirostris* Leach, 1814 (*teste* Leach, 1815)] and *Leptopodia tenuirostris* Leach, 1814 (Appendix), which are congeneric, and the first of which is the type of *Macropodia*, Edin. Encyc., 395, 1814. It should be observed that on page 395 the name *Leptopodia* appears in the synonymy of *Maia phalangium*, thus: '[*Maia*] 8. *Phalangium*. *C. phalangium* Pennant. *Leptopodia phalangium*, Leach's MSS. See plate ccxxi, fig. 4, and Appendix.' This is followed by '[Genus] XXV. *Macropodia*. Sp. 1. *Longirostris* Fabr. *C. dodecos* L.?' The genus *Macropodia* is then described. As noted above, the species *phalangium* and *longirostris* are identical. The preference should be given to the name of the genus regularly established rather than to one suggested but not adopted. *Leptopodia* of the Appendix, although probably published simultaneously with *Macropodia*, was the result of subsequent revision, and should not, I think, take precedence. *Leptopodia* is therefore a synonym of *Macropodia*. The species *sagittaria*, Fabricius, 1793, which has been considered the type of *Leptopodia*, was not placed in the genus until 1815, Zool. Misc., II, 15, and Trans. Linn. Soc. London, XI, 331, where Leach retains *Macropodia* for *phalangium* and *tenuirostris* and recharacterizes *Leptopodia*. See also Mal. Podoph. Brit., explan. of pl.

xxiii, 1815.* For *Leptopodia* Leach, 1815, not 1814, *Stenorynchus* may be used. (See page 158.)

*Clorodius* was a manuscript name of Leach, first published, but not adopted,† by Desmarest, 1823, with the name of the type, '*Cancer dentatus* Fabr.,' corrected in 1825 to '*Cancer 11-dentatus* Fabr.' The first citation was an undoubted typographical error, as there is no such species as *C. dentatus* Fabricius. The genus was briefly defined by Desmarest as having fingers with spoon-shaped tips, a character which he includes in his diagnosis of *Cancer 11-dentatus*, but which unfortunately that species does not possess, a circumstance which, it seems to me, does not invalidate the genus. *Clorodius* appears with its original signification in de Haan's 'Fauna Japonica,' 1833. In 1830, Rüppell added to the genus a species, *C. niger* (Forskæl, 1775), having little in common with the type. In 1834, Milne Edwards recharacterized the

* As the plates of Leach's 'Malacostraca Podophthalma Britanniæ' are not dated and were not issued in numerical order, it is impossible to determine the sequence of publication in a bound copy of the volume. The following table, showing the plates and the date of each number, was kindly furnished me by Mr. Stebbing, who obtained them from Mr. Bernard Quaritch, the publisher of the concluding parts:

| *Number.* | *Plates.* | *Date.* |
|---|---|---|
| I | 8, 14, 22 | Jan. 1, 1815. |
| II | 4, 15, 40 | Mar. 1, " |
| III | 17, 28 A, 28 B | May 1, " |
| IV | 19, 29, 41 | July 1, " |
| V | 23, 30 | Sept. 1, " |
| VI | 1, 2, 26 | Nov. 1, " |
| VII | 24, 36 | Jan. 1, 1816. |
| VIII | 3, 12, 13 | Mar. 1, " |
| IX | 42, 7, 43 | May 1, " |
| X | 6, 31, 32 | July 1, " |
| XI | 9, 11, 33 | Sept. 1, " |
| XII | 21 A, 21 B, 5 | Nov. 1, " |
| XIII | 18, 20 | Jan. 1, 1817. |
| XIV | 16, 25, 44 | Apr. 1, " |
| XV | 22 B, 37 A, 37 B | July 1, " |
| XVI | 22 C, 38, 39 | Dec. 1, " |
| XVII | 9 B, 10 | Mar. 1, 1820. |
| XVIII } XIX } | 9 A, 24 A, 27, 34 } 35, 37 C, 45 } | 1875. |

† I believe that if an author defines and publishes a name it becomes available over a later name whether he adopts it or not.

genus, making *C. niger* the type, and this meaning has clung to it to the present day. In restoring *Clorodius* to its original status, it becomes a synonym of *Atelecyclus* Leach, 1814. *Chlorodiella*, nov., is proposed for *Chlorodius* Milne Edwards.

*Stenocionops* Leach, MS., while not adopted by Desmarest, 1823, was said to include *Maia taurus* Lamarck, 1818, which is synonymous with *Cancer cornudo* Herbst, 1804,* and *C. furcatus* Olivier, 1791. Later, in 1825, the generic name was transferred by Latreille to the species *cervicornis* Herbst, 1803, which has ever since been regarded as the type. In its rightful meaning, *Stenocionops* takes the place of *Pericera* Latreille, Encyc. Méth., X, 699, 1825. *S. cervicornis* may be known as *Ophthalmias* (nov.) *cervicornis*.

*Naxia*, a manuscript name of Dr. Leach, was first defined and published, but not adopted, by Latreille, Encyc. Méth., Entom., X, 140, 1825, and one species assigned to it, *Pisa aurita*, nov. *Naxia* of Milne Edwards, 1834, has a different definition and contains only the species *serpulifera* Guérin; it should be considered a synonym of *Naxioides* A. Milne Edwards, 1865.

*Halimus* was very briefly described by Latreille in Cuvier's Règne Animal, ed. 2, IV, 60, 1829. No type was specified, but a single species, *H. aries* Latreille, is figured in Guérin's Iconographie. As this was the only species previous to 1834, it must

* Perhaps no single copy of Herbst's 'Naturgeschichte der Krabben und Krebse' contains all the title pages of the different parts, and hence quotations from this work are full of inaccuracies. The following table gives the date of issue, number of plates, signatures, and pages of each Heft:

| Volume. | Heft. | Date. | Plates. | Signatures. | Pages. |
|---|---|---|---|---|---|
| I | 1 | 1782 | I | A–L | 1–86 |
| I | 2–5 | 1783 | II–IX | M–Z | 87–182 |
| I | 6 | 1785 | X–XIII | Aa–Cc | 183–206 |
| I | 7 | 1788 | XIV–XVII | Dd–Gg | 207–238 |
| I | 8 | 1790 | XVIII–XXI | Hh–Mm | 239–274 |
| II | 1 | 1791 | XXII–XXV | A–F | 1–48 |
| II | 2 | 1792 | XXVI–XXIX | G–K | 49–78 |
| II | 3 | 1793 | XXX–XXXIII | L–N | 79–98 |
| II | 4 | 1793 | XXXIV–XXXVI | O–T | 99–146 |
| II | 5 | 1794 | XXXVII–XL | U–X | 147–162 |
| II | 6 et seq. | 1796 | XLI–XLVI | Y–Ff | 163–226 |
| III | 1 | 1799 | XLVII–L | A–I | 1–66 |
| III | 2 | 1801 | LI–LIV | A–F | 1–46 |
| III | 3 | 1803 | LV–LVIII | A–G | 1–54 |
| III | 4 | 1804 | LIX–LXII | A–G | 1–49 |

be considered the type. *Halimus*, Milne Edwards, 1834, contained two species, *aries* and *auritus*. The latter was already the type of *Naxia* Leach in Latreille, 1825, and the former the type of *Halimus* Latreille, 1829. *Auritus*, on the contrary, has up to this time been held the type of *Halimus*, *aries* having been put in *Hyastenus* White, 1847, which genus now becomes a synonym of *Halimus*. *Halimus*, it should be noted, was proposed by Latreille, in 1825, for "deux espèces de la collection du Jardin du Roi, et dont l'une paroît être très-voisine du *Cancer superciocisus* [*superciliosus*] de Linné." As this is not sufficient to define the genus, the name must be considered as a *nomen nudum*, at least until its description in 1829.

*Platyonichus* Latreille, Nouv. Dict. Hist. Nat., XXVII, 4, 1818, was offered as a substitute for *Portumnus*, the orthography of the latter name being considered too near that of *Portunus;* consequently *Platyonichus* must have the same type as *Portumnus*, viz., *P. latipes* (Pennant, 1777). If *Portumnus* be restored, as it has been by many writers, *Platyonichus* becomes a synonym of it, and cannot be used for the species *ocellatus*, as this species was not known to *Platyonichus* until 1825 (Latreille, in Encyc. Méth., Entom., X, 151). *Xaiva* of MacLeay, 1838, is available for *ocellatus* and its allies, the earlier *Anisopus* de Haan, 1833, being preoccupied by Meigen (Illig. Mag., II, 1803) for Diptera.

*Stenorynchus* Lamarck, 1818, was a name given to two species, *S. phalangium* and *S. seticornis* Latreille. The former was already a member of *Macropodia*, 1814. The second species is therefore the type of *Stenorynchus*. It is said to be equivalent to *Cancer seticornis* Herbst, 1788, which is congeneric, if not conspecific, with *Cancer sagittarius* Fabricius, 1793. *Stenorynchus* has always been considered synonymous with *Macropodia*.

2. *The name of a composite genus tenable for one or more of its species which do not belong in older genera.*—*Platypodia* is a name given by Bell, Trans. Zoöl. Soc. London, I, 336, 1835, to that group of species included by Milne Edwards, 1834, under *Cancer*. This last genus as defined by Milne Edwards contained none of the Linnæan species of *Cancer*, and therefore the propriety of Bell's action would not be questioned, except for the fact that previous to the publication of Milne Edwards's *Cancer*, four of the species contained therein had been assigned by de Haan, 1833, to *Atergatis* and three other species to *Actæa*. Milne Edwards does not specify the type of *Cancer*, but in illustration of the genus figures

*Cancer limbatus*. Later, 1839. Randall adopts the name *Platypodia*, coupling it with the same specific name, *granulosus* Rüppell, 1830 = *limbatus* Milne Edwards, 1834. Subsequently all the species of Bell's *Platypodia* were assigned to other genera, viz., *Medæus* Dana, 1851, *Euxanthus* Dana, 1851, *Hypocælus** Heller, 1861, and *Lophactæa* A. Milne Edwards, 1865. this last genus containing the species *Cancer limbatus* Milne Edwards. The question now arises, should *Platypodia* be considered a synonym of *Atergatis* and *Actæa*, or should it be retained for the species *limbatus?* In reviewing the genera of Brachyura, I find that in all similar cases the name of the composite genus has not been treated as a synonym. *e. g.*, *Goniopsis* de Haan, 1833, contained three species, two of which were already in the genus *Grapsus*, yet the name *Goniopsis* has been used without question for the third species. As a contrary decision would involve many needless changes, *Platypodia* is retained in place of *Lophactæa*.

3. *The name of a composite genus, when made up wholly of older genera, tenable for a component part requiring a name.*—I propose to restore the name *Phalangipus* Latreille, 1825, for *Egeria* Leach, 1815 = *Leptopus* Lamarck, 1818 = *Stenopus* Leach in Latreille, Encyc. Méth., Entom., X, 700, 1825. all preoccupied. (*Egeria* Roissy, an XIII [1804–'5], Mollusca; *Leptopus* Latreille, Gen. Crust. Insect., IV, Addenda, 383, 1809. Hemiptera; *Stenopus* Latreille in Desmarest, Dict. Sci. Nat., XXVIII, 321, 1823, Macrura.) As originally defined, Encyc. Méth., Entom., X, 699, 1825, *Phalangipus* included *Libinia* + *Doclea* + *Egeria*, all genera of Leach, 1815. The name was never used subsequently. A precedent for its restoration now in a restricted sense is to be found in *Maja*, a genus formed by Lamarck, Sys. Anim. sans Vert., 154, 1801, for *Inachus* + *Parthenope*, both of Fabricius, 1798, and first restricted by Leach, 1814, to the species *Cancer squinado* Herbst, 1785, which was a component part of the Fabrician genus *Inachus* under the name *I. cornutus* (not *C. cornutus* Linnæus, 1758). *Maja* or *Maia* in its Leachian sense has been in use without question down to

* It may be claimed that as *Hypocælus* was a preoccupied name (see page 164) it was not a genus in the proper sense, and that therefore the species of *Platypodia* (*Cancer sculptus* Milne Edwards) which was referred to *Hypocælus*, would by the process of elimination be the type of *Platypodia*. On the other hand, *C. sculptus* was an abnormal species of *Cancer* Milne Edwards (= *Platypodia* Bell), and therefore could not legitimately become its type.

the present day, and forms the typical genus of the Maiinæ, Maiidæ, and Maioidea. Should *Phalangipus* be ruled out, *Maja* also must fall. It is of interest that *Maia* was used by Brisson, 1760, for a genus of birds, accepted by many ornithologists.

4. *Specification of type.*—In 1810, Latreille, in his 'Considérations Générales sur l'ordre naturel des animaux composant les classes des Crustacés, des Arachnides, et des Insectes,' gives a supplementary list with the following heading, 'Table des Genres avec l'indication de l'espèce qui leur sert de type.' At the time of the publication of Dr. Herrick's monograph, 'The American Lobster,' I believed that the species designated by Latreille should be regarded as types of their genera, and I am not yet persuaded to reverse that decision. It has been argued "that '*Astacus fluviatilis* Fab.' is given not as *the* type, but merely as *a* type, an example, a specimen of the genus, the handiest one for a Parisian reader to recognize." The French word 'type,' however, is defined as 'type' or 'standard,' not as 'example' or 'illustration,' and although *Astacus fluviatilis* may have been the species most familiar to the Parisian reader, the same cannot be said of *Portunus pelagicus* or *Dromia rumphii*, East Indian species, chosen in preference to European. It has also been claimed that *fluviatilis* is the type of *Astacus* because it was placed first among those enumerated by Fabricius; but if this rule were applied to other Fabrician genera, we should have *fornicata* the type of *Parthenope* instead of *Cryptopodia*, *vigil* the type of *Portunus* instead of *Podophtalmus*, *scabriuscula* the type of *Leucosia* instead of *Philyra*, while *muricatus* would be an *Inachus* instead of a *Doclea*.

The present adoption of Latreille's specification affects the type of only two genera among the Brachyura, *Portunus* and *Leucosia* Fabricius, 1798. The type of the former becomes *pelagicus*, commonly attributed to *Neptunus*, de Haan, 1833, and of the latter, *nucleus*, afterward made the type of *Ilia* by Leach, 1817. *Leucosia* of Leach may be known as *Leucosides*, nov. Latreille in 1810 makes the species *pagurus* the type of *Cancer*. In 1825, in his 'Familles Naturelles,' he forms presumably for this species the genus *Tourteau*, in Gallic form, = *Pagurus* in Berthold's translation, 1827. This circumstance might be a weighty argument against the recognition of the Latreillian species as types, were it not that Leach in the mean time had indisputably restricted the genus *Cancer* to *C. pagurus*, and that in the early

days it was not deemed unpardonable to change the type of a genus.

5. *Earlier names neglected.*—A recent example of the abandonment of a valid name is the case of *Holometopus* Milne Edwards, 1853, which is a constituent of de Man's subgenus *Episesarma* of later date, 1895. Other names which have been laid aside without sufficient reason are as follows:

*Potamon* Savigny, 1816, for *Thelphusa* Latreille, 1819. *Potamon* was restored by Ortmann, Zoöl. Jahrb., Syst., IX. Heft 3, 445, 1896. Its type species is *Cancer potamios* Olivier, an 12 [1803–1804] = *Thelphusa fluviatilis* Latreille, 1819, not *C. fluviatilis* Herbst, 1785.

*Charybdis* de Haan, 1833, for *Goniosoma* A. Milne Edwards, 1860, on account of *Charybdea* Peron and Lesueur, 1809. *Goniosoma* was itself used by Perty, Delect. An. Art., 201–202, 1830–1834, for a genus of Arachnida.

*Pitho* Bell, 1835, for *Othonia* Bell, 1836, without explanation. (*Othonia*. Johnston, Loudon's Mag. Nat. Hist., VIII, March, 1835, Vermes.)

*Gecarcoidea* Milne Edwards, 1837, for *Pelocarcinus* Milne Edwards, 1853, on account of *Gecarcinus* Leach, 1814. *Gecarcoidea* was restored by Ortmann, Zoöl. Jahrb., Syst., VII, Heft 5, 1894.

*Xanthodius* Stimpson, 1859, if considered congeneric with *Leptodius* A. Milne Edwards, 1863, as it is by some writers, should take precedence, and not be treated as a synonym or a subgenus of *Leptodius*.*

Paulson, 1875, gives *Cryptochirus* Heller as a synonym of *Lithoscaptus* A. Milne Edwards, but the former genus was described in 1861, the latter in 1862.

*Arctopsis* Lamarck, 1801 (description insufficient?) is retained by Miers, 1879 and 1886, as a subgenus of *Pisa* Leach, 1814; but if *Arctopsis* be used at all, which seems unwarranted, it must take precedence of *Pisa*. The type species of both is supposed to be the same; its earliest indisputable name is *biaculeata* (Montagu). *Tetraodon*, which Miers makes the type of the subgenus *Pisa*, was not put by Leach into *Pisa* until 1815.

An example of the same name being applied by two authors to the same new genus is that of *Aulacolambrus*, a name attributed

*Leptodius* is made a synonym of *Xantho* by Ortmann, Zoöl. Jahrb., Syst., VII, Heft 3, 443, 1893.

to A. Milne Edwards, 1878, but first used by Paulson, Investigation of the Kinds of Crabs in the Red Sea, I, 9, 1875,* for *Lambrus pisoides* Adams and White, a member of Milne Edwards's genus *Anlacolambrus*.

6. *Names based on figures without description.*—*Dorynchus* first appeared in the combination '*Dorynchus thomsoni* Norman,' a species which was figured in the text but not described in Wyville-Thomson's 'Depths of the Sea,' 1873 (fig. 34 on page 174). It is referred to thus: "A pretty little stalk-eyed form *Dorynchus thomsoni*, NORMAN (fig. 34), small and delicate, and very distinct from all *previously described species of the genus*, is very widely diffused." The italics are my own, and the words emphasized may indicate that the word *Dorynchus* was accidentally used for *Inachus*, a genus containing a species *dorynchus*.† *Dorynchus thomsoni* was described and figured in a new genus by A. Milne Edwards, Crust. Rég. Mex., 349, pl. XXXI A, fig. 4, 1880, as *Lispognathus furcillatus*. Later‡ Prof. Milne Edwards, after recognizing the identity of his species and *D. thomsoni*, refers to it as '*Lispognathus* (*Dorynchus*) *Thomsoni*.' In 1886 Mr. Norman, in his 'Museum Normanianum. Crustacea,' enters the species as '*Lispognathus thomsoni*,' although more recently (December 21, 1895) he has assured me that he sees no reason why *Dorynchus* should be displaced.

A different case is that of *Planes*, a manuscript name of Dr. Leach, published by Bowdich, 1825, the claims of which are set forth by Dr. Faxon in his report on 'The Stalk-Eyed Crustacea' of the 'Albatross,' p. 29, 1895. This name is based on plate figures. In the text, p. 15, Bowdich says: "A small crab, fig. 3, *a* and *b*, which I conceive to be a new species of *planes*, was found in great numbers amongst the *anatifera*. [Foot-note:] It was of a delicate, but bright, rose colour: from the symmetrical form of its *test* (notched so regularly as to increase the projection and distinctness of its *chaperon*) it may be called *p. clypeatus*."

Mr. C. Davies Sherborn in his "Explanation of the Plan

*This work is in Russian and was published at Kiew. The title is as follows: 'Izslyedovaniya Rakoobraznuikh Krasnavo Morya.'

† *Inachus dorynchus* Leach, 1814, should be known as *Inachus phalangium* Fabricius, the *Cancer phalangium* of Fabricius, 1775, of which I have examined the type, being different from *C. phalangium* Pennant, 1777, a synonym of *Macropodia rostrata* (Linnæus), 1761.

‡ Comptes Rendus Acad. Sci. Paris, XCIII, 878, 1881.

adopted for preparing an 'Index Generum et Specierum Animalium,'"* says, p. 612: "The figure depicted on a plate may or may not be the drawing intended by the author; it is the work of the artist, who is also responsible for the descriptive legend. In numerous instances the descriptive legend on a plate is quite erroneous, and has been repudiated by the author in his text. Until the text descriptive of a plate appears, the names on the plate must be considered as *nomina nuda*, and it is open to any one to describe and rename such *nomina nuda*."

Is this rule intended to cover cases similar to *Dorynchus*, based on a text figure, and *Planes*, based on a plate figure, the name of which appears in the text without adequate description?

7. *Post-Linnæan name given by a polynomialist invalid.*—In 1763 Vosmaer in Mémoires de Mathématique et Physique, volume IV, established the genus *Notogastropus* for a crab noted and named for having feet on its dorsal as well as its ventral side. While this form was described and figured, no specific name was attached to it. It is without doubt referable to *Dorippe dorsipes* (Linnæus) 1758 = *D. quadridens* Fabricius, 1798. The name *Notogastropus* was never adopted, though it appears in synonymy in Desmarest and de Haan, for the reason probably that Vosmaer was not a binomialist, and for the same reason I have not disturbed the current name *Dorippe*, preferring to follow Rule 44 *b* of the Rules of Nomenclature adopted by the International Zoölogical Congress held in Paris, 1889, which says: "Le nom attribué à chaque genre et à chaque espèce ne peut être que celui sous lequel ils ont été le plus anciennement désignés, à la condition: *b*.—Que l'auteur ait effectivement entendu appliquer les règles de la nomenclature binaire."

8. *Preoccupied names.*—The following new generic names are proposed for names preoccupied in the same kingdom:

*Pæduma* † for *Amorphopus* Bell, 1858. (*Amorphopus* Schönherr, 'in litt.,' Gen. Curc., V, ii, 577, 1840, given as a synonym of *Caladromus;* also Serville, Hist. Nat. des Insectes Orthoptères, Paris, 1839, *teste* Agassiz.)

*Epinus* ‡ for *Apocremnus* A. Milne Edwards, 1878. (*Apocremnus* Fieber, Wien Ent. Monschr., II, 320, 1858, Hemiptera.)

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* Proc. Zoöl. Soc. London, June 2, 1896, pp. 610–614.

† *Παίδευμα*, a rudiment, in allusion to the fifth pair of legs.

‡ *Αἰπεινός*, steep.

*Carcinides* for *Carcinus* Leach, 1814. (*Carcinus* Latreille, Préc. Car. Génér. Insectes, 197, 1796, Amphipoda.)

*Cycloxanthops* for *Cycloxanthus* A. Milne Edwards, 1863. (*Cycloxanthus* Milne Edwards, D'Archiac's Hist. Prog. Géol., III, 304 k, 1850, fossil Brachyura.)

*Tympanomerus** for *Dioxippe* de Man, 1888. (*Dioxippe* Thomson, Fam. Cérambycides, 355, 1860, Coleoptera.)

*Ericerodes* for *Ericerus* Rathbun, 1893. (*Ericerus* Signoret, 1874, Coccidæ, *teste* Cockerell.)

*Hypocolpus*† for *Hypocœlus* Heller, 1861. (*Hypocœlus* Eschscholtz, Silbermann's Rev., IV, tab., 1836, Coleoptera, *teste* Gemminger and Harold.)

*Hapalonotus*‡ for *Malacosoma* de Man, 1879. (*Malacosoma* Hübner, Verz., 192, 1816, Lepidoptera.)

*Dasygyius*§ for *Neorhynchus* A. Milne Edwards, 1879. (*Neorhynchus* Sclater, Proc. Zoöl. Soc. London, 1869, 147, Aves.)

*Apiomithrax*|| for *Phycodes* A. Milne Edwards, 1869. (*Phycodes* Guenée, Spéc. gén. d. Lép., VI, 389, 1852, Lepidoptera.)

*Eriphides* for *Pseuderiphia* A. Milne Edwards, 1880. (*Pseuderiphia* Reuss, Denksch. d. k. k. Akad. Wien, XVII, 54, 1859, fossil Brachyura.)

*Apias*¶ for *Pyria* Dana, 1851; *pyrum*, a pear. (*Pyria* Saint-Fargeau and Serville. Encyc. Méth., Entom., X, 494, 1825, Hymenoptera; πῦρ, a fire.)

*Leurocyclus*** for *Salacia* Milne Edwards and Lucas, 1843. (*Salacia* Lamouroux, Hist. Pol. Coral. Flex., 212, 1816.)

*Thersandrus*†† for *Sisyphus* Desbonne and Schramm, 1867. (*Sisyphus* Latreille, Encyc. Méth., Entom., X, 438, 1825, Coleoptera; *Sysiphus*, 1818; *Sisyphe*, 1807.)

*Sphenomerides* for *Sphenomerus* Wood-Mason, 1891. (*Sphenomerus* Candèze, Mon. Élat., II, 1859, Coleoptera.)

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* *Τύμπανον*, a drum or tympanum; *μέρος*, merus.

† Ὑπό, under; *κόλπος*, a hollow.

‡ Ἁπαλός, soft; *νῶτος*, back.

§ Δασύς, hairy; *γυῖον*, limb.

|| Ἄπιον, a pear; *Mithrax*.

¶ Ἄπιον, a pear; with the suffix *ας*.

** Λευρός, flat; *κυκλός*, circle.

†† The son of Sisyphus.

*Xanthias* for *Xanthodes** Dana, May, 1852. (*Xanthodes* Guénée, Spéc. Gén. d. Lép., VI, 209, Jan., 1852, Lepidoptera. Noticed in Bibliographie de la France, Jan. 10, 1852.)

The following published names should be substituted for preoccupied names:

*Palicus*† Philippi, 1838, for *Cymopolia* Roux, 1828. (*Cymopolia* Lamouroux, Hist. Pol. Coral. Flex., 292, 1816.)

*Podohuenia* Cano, 1889, for *Ixion* Paulson, 1875. (*Ixion* Reitter, Verh. Ver. Brünn, XI, 44, 1872, Coleoptera, *fide* Zoöl. Rec., 1873.)

*Dilocarcinus* Milne-Edwards, 1853, for *Orthostoma* Randall, 1839, type *O. dentata* Randall, 1839 = *Dilocarcinus multidentatus* von Martens, 1869. (*Orthostoma* Ehrenberg, Symbolæ Physicæ, Anim. Evert., Decas Prima, 1831, Vermes.)

*Kaempferia* suggested but not adopted by Miers, 1886, for *Macrocheira* de Haan, 1839, 'preoccupied.' (*Macrochira* Meigen, Ill. Mag., 1803, Diptera. *Macrocheirus* Schönherr, Gen. et Spec. Curcul., 1838, Coleoptera, concerning which he says '*Macrocheira* Nov. Gen. et Spec. Dom. de Haan in Litteris.')

The following may be used for names preoccupied though with different gender terminations:

*Rhodia* Bell, 1835, for *Herbstia* Milne Edwards, 1834. (*Herbstium* Leach in Desmarest, Dict. Sci. Nat., XXVIII, 301, 1823, Macrura.)

*Grapsillus* MacLeay, 1838, for *Trapezia* Latreille, 1825. (*Trapezium* Humphrey, Mus. Calonnianum, 1797, Mollusca.)

*Hypopeltarium*‡ Miers, 1886, for *Peltarion* Hombron and Jacquinot, 1852? (*Peltarium* G. Fischer de Waldheim, Bull. Soc. Imp. Nat. Moscou, XVII, part 1, 106, 1844, Coleoptera.)

*Eurypanopeus*§ A. Milne Edwards, 1880, for *Panopeus* Milne Edwards, 1834. (*Panopea* Ménard, Ann. Mus., IX, 135, 1807,

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*Ortmann, Zoöl. Jahrb., Syst., VII, Heft 3, 443, 1893, unites *Xanthodes* with *Xantho*.

†Since the publication of my 'Synopsis of the American Species of *Palicus* Philippi (= *Cymopolia* Roux),' pp. 93 to 99 of these Proceedings, Professor Jeffrey Bell and Dr. Hilgendorf have kindly sent me copies of the original description of *Palicus*. Though brief, it agrees with *Cymopolia*. Dr. Philippi was doubtless soon convinced of the identity of his genus with the earlier one, as the complete description and figure which he promised to publish in Wiegmann's Archiv never appeared.

‡*Hypopeltarium* was substituted by Miers, 1886, for *Peltarion* (name preoccupied) and has been in use ever since.

§Admitting that *Eurytium* Stimpson, 1859, is a distinct genus.

Mollusca.) *Panopea* is the name of one of the Nereids. *Cancer Panope* Herbst, from which the name *Panopeus* was derived, doubtless referred to the same character.

*Engonionotus*,* nov., for *Cosmonotus* Adams and White, 1847. (*Cosmonota* Dejean, Catal. Col., 3d ed., 1833. I have seen only the reprint of the 3d ed., 1837.)

*Charybdella*, nov., for *Cronius* Stimpson, 1860. (*Cronia* H. and A. Adams, Gen., I, 128, 1858, Mollusca.)

*Euxanthopsis*, nov., for *Euxanthus* Dana, 1851 = *Melissa* Strahl, 1861. (*Euxanthe* Hübner, Verz., 39, 1816, Lepidoptera. *Melissa* Smith, 1854, Cat. Brit. Mus., II. 279, Hymenoptera.)

*Raphonotus*,† nov., for *Fabia* Dana, 1851. (*Fabius* Duncan, Foreign Butterflies, 167, 1837, *teste* Scudder.)

*Leucocarcinus*,‡ nov., for *Leucisca* MacLeay, 1838. (*Leuciscus* Cuvier, Règne Animal, ed. 1, 194, 1817, Pisces.)

*Zalasius*,§ nov., for *Trichia* de Haan, 1841. (*Trichius* Fabricius, Sys. Entom., 40, 1775, Coleoptera.)

Those names which are spelled alike except for their termination and have different meanings are not considered the same, *e. g.*, *Achæus* Leach, 1817, is not displaced by *Achæa* Hübner, 1816, both being proper names. The same is true of *Nemausa* A. Milne Edwards, 1875, and *Nemausus*, Stal, 1865.

9. *Names given simultaneously to different genera.—Acanthodes* was proposed by de Haan, 1833, for a genus of crabs. The same name was used by Agassiz, July, 1833, for a genus of fishes; it was, however, substituted for his *Acanthoessus*, 1832. For this reason, and because it cannot be proved that *Acanthodes* de Haan is of later date, it seems best to preserve the name for the crustacean genus.

*Thia* Leach, 1815, bears the same date as *Thia* Oken, Lehr. Naturg., 3te Theil, 1te Abth., a genus of Vermes. *Thia* Oken appears in a scheme of classification on p. xiii, and in the index or 'Register' at the end of the same work (p. xvii), but not in the body of the work, where it is called *Amphinome* (*teste* Faxon). It is impossible to tell which genus, Oken's or Leach's, was first published, but as the former is, I believe, a synonym, and per-

* *Ἐγγώνιος*, angular; *νῶτος*, back.

† *Ῥαφή*, suture; *νῶτος*, back.

‡ *Λευκός*, white; *καρκίνος*, crab.

§ *Λάσιος*, hairy; *ζα*, intensive prefix.

haps was never used except by Oken, the name *Thia* may properly be used for the crustacean genus.

*Kraussia* was used by Dana for a genus of crabs,* and by Davidson for a genus of mollusks† in the same month of the same year, May, 1852; but Davidson in 1859 changed his *Kraussia* to *Kraussina*, acknowledging the priority of Dana's genus.

10. *Original orthography to be preserved except in case of typographical error.*—According to Canon XL of the A. O. U. Code, we should write *Ethusa* not *Æthusa*, *Ethra* not *Æthra*, *Eriocheir* not *Eriochirus*, *Podophtalmus* not *Podophthalmus*, *Zosimus* not *Zozymus*, *Lophozozymus*, *Stenorynchus*, *Dorynchus*, *Loxorynchus*, *Pyromaia* Stimpson, 1871, not *Apiomaia* von Martens, 1873. *Goneplax* Leach, Edin. Encyc., VII, 1814, was spelled *Goneplat* on p. 393, *Goneplax* on p. 430. The first form may be considered a typographical error. *Goneplax* was so used by Leach in 1815; in 1816 written *Gonoplax;* since that time both *Goneplax* and *Gonoplax* by different authors.

* Proc. Acad. Nat. Sci. Phila., VI, 86.

† Ann. Nat. Hist., (2) IX, 369.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# TWO NEW PLANTS FROM MOUNT MAZAMA, OREGON.

BY FREDERICK V. COVILLE AND JOHN B. LEIBERG.

**Arenaria pumicola,** sp. nov.*

Plant forming a rather loose tuft, commonly 6 to 12 cm. high, from a caudex with a deep tap-root and with naked ascending branches commonly 1 to 2 mm. in thickness; stem erect, smooth below, glandular-hairy above, with commonly 1 to 3 pairs of cauline leaves; basal leaves numerous, about 0.5 to 0.7 mm. wide by 10 to 20 or even 30 mm. long, glabrous, glaucous, entire to remotely or sometimes even closely denticulate on the margin, abruptly and rather bluntly acute at the apex, the cauline leaves similar but about twice as broad and seldom more than 10 or 12 mm. long; inflorescence at the first flowering compact, in age open, the branches of the cyme and often the midribs of the sepals glandular-hairy; bracts ovate, acute to acuminate, scarious, glabrous; sepals 2 to 3 or sometimes even 4 mm. long, ovate, with a sharply defined midrib and broad scarious margins, acute or through the expansion of the margins obtuse; petals about twice as long as the sepals, cuneate-oblanceolate, emarginate or erose at the usually truncate apex; stamens about as long as the petals, the anthers commonly purple; ovary globose; capsules at maturity probably nearly twice as long as the calyx; mature seeds not seen.

Type specimen in the United States National Herbarium, collected August 13, 1896, at Crater Lake, Oregon, at an altitude of 2180 meters, by Frederick V. Coville and John B. Leiberg, No. 349.

This plant appears to be most closely related to *Arenaria aculeata* Wats., differing in the naked, ascending, subterranean caudex branches bearing the congested foliage in tufts at their

* On the ground of euphony the combination of letters *icic*, which in strict etymological practice would occur in this word, has been reduced to *ic*.

ends; the leaves not very stiff and with only an abrupt, very short, and scarcely pungent horny apex; and the sepals with the green median portion rather narrow, usually abruptly delimited by the broad hyaline margins, and commonly with little tendency to be striate when dry. *Arenaria aculeata* is a plant with spreading, procumbent, matted stems retaining their more scattered widely spreading dead foliage for several years; the leaves stiff, tapering at the apex into an extremely sharp horny spine; and the sepals with a broad midrib not usually sharply delimited and when dry commonly 3 to 5-striate. In the field the plants are at once distinguishable by their strikingly different habit and by the difficulty of handling *aculeata*, the leaves of which readily pierce the skin, a difficulty which was not experienced in the case of *pumicola*.

Our plant is a characteristic species of the open slopes of pulverized pumice-stone about the rim of Crater Lake, Mount Mazama, Oregon, and specimens in the National Herbarium collected by Lemmon in 1875 show that it occurs also in northeastern California. *Arenaria aculeata* ranges from the plateau of northern Arizona through the mountains of Nevada and Utah to those of southwestern Idaho and eastern Oregon.

Our plant bears considerable resemblance to some herbarium specimens which are referred to *Arenaria congesta subcongesta* Wats., but the type of that complex of forms differs in its spreading instead of erect leaves, slenderer and more persistently leafy branches of the rootstock, longer calyx (about 5 mm.) and glabrous stems and inflorescence.

**Cardamine bellidifolia pachyphylla**, var. nov.

Plant wholly devoid of pubescence, low, 4 to 8 cm. high, from a branching caudex commonly 2 mm. thick, and with a deep tap root, the branches usually short, but sometimes long and flexuous; leaves mostly gathered in subrosulate tufts at the ends of the caudex branches, the blades fleshy in texture, even the midrib nearly obliterated, 6 to 12 or even 16 mm. long, obovate to narrowly oblong, rounded at the apex, entire or with an indistinctly defined lobe on either side toward the apex, abruptly or gradually narrowed into petioles 1 to 3 cm. in length and purplish at the base or throughout; flowering stems short, erect, 1 or 2 from each branch of the caudex, 3 to 5 cm. high, leafless or bearing one or two short-petioled oblanceolate or obovate leaflets; inflorescence a short terminal raceme, the flowers seldom more than 10, on pedicels commonly 5 to 10 mm. long; sepals 2 to 3 mm. long; petals a little more than twice as long, spatulate, obtuse, white or rose-colored; siliques about 3 cm. long

and 1.5 mm. wide, fastigiately erect on the slender ascending pedicels, the styles exceeding the valves by about 2 mm.; seeds in one row, oblong, flat, not winged, often margined at the distal end, about 2 mm. long by 1 to 1.2 mm. wide, the cotyledons accumbent.

Type specimen in the United States National Herbarium, collected August 15, 1896, at Crater Lake, Mount Mazama, Oregon, at an altitude of 2300 meters, by Frederick V. Coville and John B. Leiberg, No. 426.

The typical form of *Cardamine bellidifolia* is a less robust plant, slenderer throughout, the caudex and its branches commonly about 1 mm. thick; the leaves of a light green color and thinner texture, with venation clearly evident on the back, at least in dried specimens, and the petioles apparently always green throughout; the capsules about 2 cm. long, their styles exceeding the valves by about 1 mm.; the fruiting pedicels seldom exceeding 6 mm., usually less than 5 mm.; and the seeds commonly 1 by 1.5 mm.

*Cardamine bellidifolia*, a circumpolar plant, is known sparingly in the Western Hemisphere from Greenland to the islands of Bering Sea, southward to the White Mountains of New Hampshire, the Rocky and Selkirk Mountains of British Columbia, and the Cascade Mountains of Washington. As indicated by both American and European specimens, it is a plant of humid habitat, often if not always growing in mossy places and on granitic soil. *C. bellidifolia pachyphylla* occupies geographically a position contiguous to the westernmost arm of southern montane extension of *C. bellidifolia*, namely, the Cascade Mountains of southern Oregon and adjacent isolated peaks in northern California. The soil on which it grows at Crater Lake, where it occurs on the rocky slopes of the Watchman, is a pulverized pumice. This, although in early spring well supplied with moisture from the melting snow, soon becomes very dry at the surface and supports only a scanty vegetation, even mosses being almost entirely wanting. Doubtless on Lassen Peak and Mount Shasta, both of which are volcanic cones, it finds a similar soil. Under these conditions it appears to have differentiated from the typical *C. bellidifolia* by sending down a deeper tap-root for moisture and by developing thicker leaves to accommodate itself to drier surroundings and reduced transpiration.

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PROCEEDINGS

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MARINE BIOLOGICAL LABORATORY WOODS HOLE MASS.

# NOTES ON THE NOMENCLATURE OF FOUR GENERA OF TROPICAL AMERICAN MAMMALS.

BY T. S. PALMER.

It is generally admitted that stability in nomenclature can only be attained by adhering strictly to the law of priority and adopting the earliest available name for each genus and species. Some of the early writers used native names as generic designations of mammals and birds, but such terms were rejected almost without exception by certain zoölogists, who maintained that only scientific names of classical origin should be used. Illiger, and to a less extent Cuvier, were leaders in the reform against 'barbarous' names, and in carrying out their views did not hesitate to replace earlier names by others which they deemed more appropriate. As their classification of mammals and birds was very generally adopted, their nomenclature was accepted without question. At present, however, derivation is considered of much less importance than priority, and one recent writer, Liais, has even gone so far as to maintain that in the case of South American species scientific names derived from Indian names are preferable to any others. It must be admitted that no valid objections can be urged against barbarous names when such genera as *Alactaga*, *Arahi*, *Babirussa*, *Coendou*, *Indri*, *Linsanga*, and many others receive general recognition.

Some of Cuvier's and Illiger's genera have already been abandoned in favor of earlier ones, but there are still several others, as *Tatusia*, *Dicotyles*, *Cercoleptes*, and *Chrysothrix*, which are unfortunately antedated by valid names. The nine-banded armadillo was placed in a distinct group, *Tatusie*, by Cuvier in 1822,

but the name was not published in Latin form until 1827, when it appeared in Lesson's 'Manuel de Mammalogie,' p. 309. As early as 1803, Blumenbach named the same species *Tatu novemcincta*,* and in 1809 figured it under the same designation in his 'Abbildungen Naturhistorischer Gegenstände,' No. 83. *Tatu*, having at least 24 years priority, should therefore replace *Tatusia*.

The peccaries are almost universally placed in the genus *Dicotyles* erected by Cuvier in 1817, but in 1814 Fischer proposed *Tayassu*,† a modified form of the native name, for the same group. Fischer recognized two species, *Tayassu pecari*, based on *Sus tajacu* of Linnæus, and *Tayassu patira*. He gave full generic and specific descriptions and a list of synonyms for each species. To see that *Tayassu pecari* and *T. patira* were intended as scientific and not as vernacular names, it is only necessary to notice that they are used in precisely the same way as *Sus æthiopicus*, *Tapirus americanus*, and many others on the pages immediately preceding or following the descriptions of these species. *Dicotyles* therefore becomes a synonym of *Tayassu* and necessitates a change in the family from Dicotylidæ to Tayassuidæ.

The kinkajou of tropical America is usually known as *Cercoleptes*, although it has at least 3 earlier names (*Potos* Cuvier and Geoffroy, 1795, *Kinkajou* Lacépède, 1801, and *Caudivolvulus* Dumeril, 1806), which were given as synonyms of *Cercoleptes* by Illiger when he redescribed the genus in 1811. All of these genera were based on the same species, and *Potos*‡ should be adopted as the earliest available name.

Kaup's genus *Chrysothrix*, described in 1835 for the small squirrel monkeys, is also antedated by the native name *Saimiri*, which was used as a subgenus by Voigt in 1831. § Voigt published the species as *Simia* (*Saimiri*) *sciurea*, and his *Saimiri* should have preference over the later *Chrysothrix*.

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* Handbuch der Naturgeschichte, 7te Auflage, 1803, 105–106; 10te Ausgabe, 1821, 111. The first edition of this work appeared in 1779, and the name may have been published much earlier than 1803, but I have not been able to examine any of the first six editions.

† Zoognosia, III, 1814, pp. 284–289.

‡ Méthode Mammalogique in Mag. Encyclopédique, lère année, II, 1795, p. 187.

§ Cuvier's Thierreich, I, 1831, p. 95.

VOL. XI, PP. 175-178 JULY 1, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# A NEW FUR-SEAL OR SEA-BEAR (*ARCTOCEPHALUS TOWNSENDI*) FROM GUADALUPE ISLAND, OFF LOWER CALIFORNIA.

BY C. HART MERRIAM.

During the recent international discussion respecting the seals of Bering Sea, the matter of the distribution of the Northern Fur-seal (*Callorhinus ursinus*) has received closer attention than heretofore, and questions have arisen as to the southernmost range of the species in the past.

It had been known for many years that colonies of fur-seals inhabited parts of Guadalupe and the San Benito Islands, off the coast of Lower California, and these seals were commonly assumed to be the northern species—the same that breeds in such numbers at the Pribilof Islands in Bering Sea. But it seemed to me a violation of the known laws of geographic distribution that a species adapted to the arctic climate and cold waters of Bering Sea, and even there requiring constant fogs to protect it from the feeble rays of the sun, should be able to breed under clear skies on the subtropical islands of Guadalupe and San Benito.

During the sessions of the Bering Sea Joint Commission, in February and March, 1892, I made bold to express the opinion that the fur-seal which breeds on these islands would prove to be, not the northern species belonging to the genus *Callorhinus*, but a southern species belonging to the genus *Arctocephalus*. No specimens were at hand for examination, but through the co-operation of the Department of State and Fish Commission I was enabled to send a small boat, in direct charge of Mr. C. H. Townsend, on a special mission to Guadalupe Island.

Mr. Townsend sailed from San Diego on May 14, 1892, reached Guadalupe on the 16th, and remained there until the 27th. He

saw seven fur-seals and shot one, which sank before it could be recovered. The trip was made too early in the season to find the seals on shore. A locality was visited where it was known that a large number had been killed a few years previously, and here four skulls were obtained. These skulls were immediately sent to Washington and on their arrival were examined by Dr. J. A. Allen, Dr. Theodore Gill and myself, and proved, as had been suspected, to belong to the genus *Arctocephalus.* A joint note to this effect was published by us in the *Fur-Seal Arbitration, Appendix to the Case of the United States*, vol. I, p. 586, 1892. In the same volume (p. 373) Dr. Allen expresses the belief that the skulls in question represent an undescribed species. The northernmost locality from which the genus had been previously recorded is the Galapagos Islands under the equator, about 2500 miles southeast of Guadalupe.

In his manuscript report on the Guadalupe trip Mr. Townsend states: "Guadalupe Island is thoroughly volcanic and there are caves by the dozen along every mile of the shoreline which were once the retreats of thousands of fur-seals. On the afternoon of May 17 we saw four seals swimming some distance off shore. Two of these we believed to be fur-seals, but could not get within shooting distance, although we tried for an hour. The other two, seen later, were undoubtedly *Zalophus.* No seals whatever were found on the rocks. . . . On May 22 we examined SW Point and the three islands or rocks south of it. On the most southerly rock we found a band of *Zalophus*, about thirty in number, hauled out. There were no fur seals among them. Passing the point, we continued, pulling in the dory, the schooner lying to off shore, up the west side of the island about eight miles, where we anchored. In the evening we visited the spot where Borges and Sisson had killed two or three hundred fur-seals about ten years before. Only a few weather-worn skulls were found, which we gathered for shipment to Washington. The next day, May 23, we hunted along shore, in the boat as usual, as far as the next point south of NW Point about six miles, the schooner keeping well off shore. At 10 A.M., near the outlying rocks off this point, we found what seemed to be a male fur-seal, perhaps about four years old, asleep on the water with his fins held aloft in the manner so characteristic of these animals. I got a pretty fair shot with the rifle but missed. Half an hour later I shot a female fur-seal, killing it instantly. Before we could get the hook on it, it sank below our reach, although

only three boat-lengths away when shot. The water was perfectly clear and we could see the animal sinking when we reached the bloody spot on the water. It began to sink *immediately* when shot. With an extra long hook we might have reached it. We remained in the neighborhood for an hour, but no more seals were seen. While lying to with the vessel about two miles off this point the Captain saw two fur-seals from the vessel, but was powerless to try getting them. It was on the rocks at this point that Capt. Hunt had killed a pup fur-seal the year before (1891)."

In addition to his own observations Mr. Townsend collected from California sealers some very important information respecting the abundance of the Guadalupe fur-seal and the numbers killed in recent years. This may be summed up as follows:

In 1880 Capt. Geo. W. Chase, of San Diego, made several trips to Guadalupe for fur-seals, which he found "tightly packed in the caves and holes [in the rocks]." He generally fired at their eyes in the darkness of these places, but sometimes used candles. His skins sold for $15 each, from which he made $2,200 in 1880. The same man (Capt. Chase) stated that about a year earlier a Mr. Borges sold his catch of Guadalupe sealskins at San Francisco for over $20,000 (the rate being $10 to $15 per skin).

In 1883 Capt. Geo. E. Wentworth killed about 2,000 fur-seals on Guadalupe. Captain Wentworth states that several other vessels were there at the same time, and that the Guadalupe fur-seal was practically [commercially] exterminated that year—1883.

In 1890 Capt. Nelson told Mr. Townsend that he had killed fur-seals with more or less regularity every year on the exposed shingle beach at the NW end of Guadalupe Island, where he pursued them into the caves and killed them with clubs.

In 1891 Geo. M. Hunt, of San Diego, visited Guadalupe in December for the purpose of sealing and killed 5 fur-seals—4 adults on the east side and one pup on the northwest side. A few others were seen off shore.

Recently I have compared the skulls collected at Guadalupe by Mr. Townsend with a series of skulls of *Arctocephalus australis* or *phillipi* from the Galapagos Islands, also collected by Mr. Townsend, and find the two to be very distinct species. In view of these facts it seems particularly appropriate that the new species should bear Mr. Townsend's name, which I take pleasure in bestowing upon it.

The material on which the new species is based consists of four

skulls picked up on the beach. One of these, the type, is an adult male which has lost the teeth and lower jaw. Another is a young adult female with both jaws and all the teeth. The remaining two are very imperfect, lacking both the jaws and face.

The species seems doomed to speedy extermination, and, so far as known, no museum in the world has a single specimen. It is hoped that our National Museum will be able to secure complete specimens before it is too late.

**Arctocephalus townsendi** sp. nov. Guadalupe Fur-seal.

*Type locality.*—Guadalupe Island, off Lower California. Type No. 83617, ♂ ad., U. S. National Museum. Collected on the beach on west side of Guadalupe May 22, 1892, by C. H. Townsend.

*Cranial characters.*—Contrasted with skulls of *Arctocephalus* (*australis* or *phillipi*) from the Galapagos Islands, skulls of *A. townsendi* differ in somewhat smaller size; much shorter rostrum; shorter nasals; larger and more freely open incisive foramina; heavier and shorter ascending branches of premaxillæ, which do not push backward along the nasals as in *australis;* smaller, flatter, and smoother audital bullæ; *much narrower* and more deeply excavated palate; narrower postpalatal notch; broader and heavier jugals; broader zygomatic processes of maxillæ, which are *expanded to form a broad floor under* the anterior half of the orbit; larger, broader, and more rounded anterior nares in the male, and absence of sagittal crest between frontals.

The most important characters are the exceedingly narrow and excavated palate, flat audital bullæ, short and thick ascending arm of premaxilla, and broadly expanded zygomatic root of maxilla, forming a floor under the anterior half of the orbit. There are also tooth characters: the first upper molar (5th molariform tooth) is mainly posterior to plane of anterior root of zygoma; both upper true molars are double rooted, and the last upper premolar is incompletely double rooted.

In the female of *townsendi* the narrow and deeply excavated form of the palate is even more emphasized than in the male, and the postorbital constriction is very much narrower than in the female of *australis.*

*Measurements of ♂ Skull of Arctocephalus townsendi (the type).*

| | |
|---|---|
| Greatest basal length (gnathion to occipital condyles) | 256 |
| Basal length (gnathion to basion) | 243 |
| Basilar length of Hensel (basion to incisors) | 233 |
| Palatine length (gnathion to postpalatal notch) | 120 |
| Postpalatal length (postpalatal notch to basion) | 125 |
| Zygomatic breadth | 151 |
| Lateral series of teeth (canine to last molar inclusive) | 88 |
| Distance between canines | 22.5 |
| Distance between 3d pair of molariform teeth | 22.5 |
| Breadth (anteroposterior) of zygomatic root of maxilla between inferior lip of antorbital foramen and orbit | 21 |

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

MARINE BIOLOGICAL LABORATORY WOODS HOLE MASS.

# A NEW BAT OF THE GENUS *ANTROZOUS* FROM CALIFORNIA.

BY C. HART MERRIAM.

Up to the present time only a single species of the genus *Antrozous* has been recognized. It was described by Le Conte in 1853, under the name *Vespertilio pallidus*, from a specimen said to be from California. But later, both Baird * and Harrison Allen † state explicitly that Le Conte's type came from El Paso, Texas, where it was collected by the U. S. and Mexican Boundary Commission. Moreover, the measurements of the type specimen show that it is the Sonoran desert form—not the Californian.

The specimens collected in Nevada and California by the Death Valley Expedition in 1891 show that the typical form ranges westward from El Paso over the Sonoran deserts of the southern part of the Great Basin as far as Owens Valley, at the east base of the Sierra Nevada, and that another form occupies the region west of the Sierra. The latter was described by me five years ago, under the name *Antrozous pallidus pacificus*, but the description, along with a number of others of new mammals collected by the expedition, was held for the mammal report, which has been so long delayed and which is not likely to be printed for another year. For this reason it is thought best to publish the description in advance of the report, and it is presented herewith.

The Biological Survey has secured a fine series of specimens of *Antrozous*, illustrating its distribution from Mexico to Oregon;

* Mexican Boundary Survey, vol. II, part II, Mammals, p. 5, 1859.

† Monograph of the Bats of North America, p. 69, 1864.

but since the detailed ranges of the two forms will be given shortly in Mr. Gerrit S. Miller's Monographic Revision of the Vespertilionidæ, they need not be repeated here.

The type of the new form is selected from three specimens shot by me at old Fort Tejon, California, on the evening of June 28, 1891. Two of these three specimens were females containing large embryos, nearly ready for birth.

**Antrozous pallidus pacificus** subsp. nov.

*Type* from old Fort Tejon, Cañada des las Uvas, California. No. 29815, ♂, U. S. Nat. Mus., Biological Survey Coll. Collected June 28, 1891, by C. Hart Merriam. Original No. 208.

*General characters.*—Similar to *A. pallidus* but uniformly larger (forearm averaging 5 mm. or more longer) and darker; ears somewhat narrower (breadth 18 or less instead of 21 or more) and less convex anteriorly, with posterior edge of upper third slightly emarginate instead of straight.

*Color.*—Upper parts ochraceous buff, strongly washed with dusky; under parts rich buff instead of whitish.

*Measurements* (of type, from alcoholic specimen).—Head and body, 70; tail, 43; head, 25; ear from external basal angle, 30; tragus from inner base, 10; greatest breadth of ear, 17.5; forearm, 59; thumb, 11; 3d finger, 93; 5th finger, 73; tibia, 21; hind foot, 13.

VOL. XI, PP. 181-183 JULY 1, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTION OF A NEW GENUS AND SPECIES OF SPHÆROMIDÆ FROM ALASKAN WATERS.*

BY HARRIET RICHARDSON.

The dredgings made by the U. S. Fish Commission Steamer 'Albatross' off the Alaskan coast in the years 1888–1894 contain a number of specimens of Sphæromidæ which evidently belong to a genus hitherto undescribed. Although it is impossible to refer these specimens to the genus *Ancinus* of Milne Edwards, yet they are more closely related to that genus than to any other. They resemble *Ancinus* in the possession of subchelate hands terminating the first and second pairs of gnathopods.

**Tecticeps** gen. nov.

Body oval and somewhat flattened.

Head subquadrangular, broader anteriorly than posteriorly, with its anterior and lateral margins produced, concealing the antennæ.

The antennæ, which are entirely hidden, extend backward and lie under the epimeral plates at the sides of the thorax.

The first and second pairs of legs are subchelate; the first pair terminate in a large hand and finger, bearing a small hook; the second pair terminate in a more irregularly shaped hand. All the other legs are simple in structure.

The terminal segment of the abdomen is triangular and entire and is pointed at its extremity. The uropoda are double-branched and lateral, and resemble closely those of the genus *Sphæroma*.

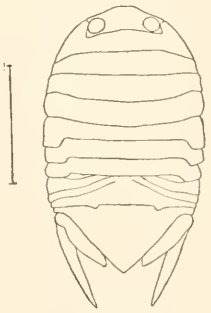

FIG. 9.—*Tecticeps alascensis*. × 2¼.

*Published by permission of the Secretary of the Smithsonian Institution.

This genus differs from the genus *Ancinus* of Milne Edwards—

1. In having uropoda with two branches instead of one.
2. In having the abdomen entire and not truncate at the tip.
3. In the prominent projection of the anterior and lateral margins of the head.
4. In the concealment of the antennæ, which are very conspicuous in the *Ancinus*.

### Tecticeps alascensis sp. nov.

Outline of body oval. Surface quite smooth, but covered with little points of depression.

Head large; twice as long as any one of the thoracic segments. The anterior margin is produced in a way to conceal the antennæ, as are also the antero-lateral margins, making the anterior portion of the head in front of the eyes much broader than the posterior portion, and forming very acute antero-lateral angles. This frontal margin forms a very broad obtuse angle with its apex in the median line. On either side of this apex to the antero-lateral angle this portion of the head is somewhat depressed. The antennæ are not conspicuous, lying concealed beneath the frontal margin of the head. The first pair extends to the posterior angle of the first thoracic segment; its flagellum contains ten articles. The second pair reaches the middle of the second segment; its flagellum is twelve-jointed. The eyes are dorsally situated on the posterior half of the head.

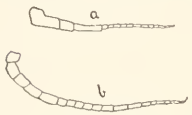


Fig. 10.—*a*, Antenna of 1st pair; *b*, Antenna of 2d pair. × 5⅔.

The thoracic segments are about equal in length. The first one extends laterally around the posterior portion of the head, forming a broad plate at the side of the segment. The epimera of all the segments are about twice as broad as long, with the exception of those of the fifth segment, which are nearly square and very conspicuous.

The first segment of the abdomen has three suture lines, and its posterior margin projects down at the sides over the terminal segment. The terminal segment is triangular, and has a very pointed extremity. The uropods differ considerably. The inner one is broad and tapering, and does not reach the tip of the abdomen. The outer one is slender and sharply pointed, and extends beyond the abdomen.

Fig. 11.—*a*, Mandible; *b*, Mandibular appendage. × 5⅔.

The first pair of legs are subchelate, as are also the second pair. In the first pair the propodus is large and oval in shape, and bears in the palma a row of stiff bristles at regular intervals and pointing obliquely in the same direction, while a thick row of fine cilia, pointing obliquely in the opposite direction, cross these almost at right angles. The dactylus terminates in a single hook, at the base of which two smaller hooks are situated. In the legs of the second pair the propodus is irregular in shape with an indication of a rudimentary

pollex. There are no hairs or bristles in the palma. The legs of the third, fourth, and fifth pairs present nothing unusual in structure, but resemble the ambulatory legs common to this family. In the sixth and seventh pairs the structure is the same as that of the preceding legs of the third, fourth, and fifth pairs, but with an increasing disproportion in the length of the propodus and dactylus. In the seventh pair of legs these joints, but more especially the propodus, attain a size most conspicuous for their length. The propodus becomes over $3\frac{1}{2}$ times longer than the carpus which immediately precedes it.

*Color.*—The color varies from dark brown to yellow, more or less dotted with black. In the darker specimens the epimera and the uropods are almost white, with scattered spots of black. Other specimens are brown with markings of red, and some are bluish-gray in color tinged with brown or orange.

*Type.*—The type specimen was found at Station 3515, latitude 59° 59′ N., longitude 167° 53′ W., at a depth of 13 fathoms. Catalogue No. 20031.

*Distribution.*—This species extends all along the coast of Alaska, having been found at the following stations: Station 3272, north of Amak Island (31 fathoms); Station 3297, off Cape Menchikoff (26 fathoms); Station 3246, south of Hagemeister Island ($17\frac{1}{2}$ fathoms); Station 2841, North Head, Akutan Island (56 fathoms); Station 3248, off Bristol Bay (21 fathoms); Station 3600, on the coast of California (9 fathoms).

FIG. 12.—*a*. Leg of 1st pair. × $5\frac{5}{3}$.
*b*. Last two joints of same. × $10\frac{2}{3}$.
*c*. Leg of 2d pair. × $5\frac{2}{3}$.
*d*. Leg of 3d pair. × $5\frac{2}{3}$.
*e*. Leg of 6th pair. × $5\frac{2}{3}$.
*f*. Leg of 7th pair. × $5\frac{2}{3}$.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTION OF A NEW *BASSARISCUS* FROM LOWER CALIFORNIA, WITH REMARKS ON '*BASSARIS RAPTOR*' BAIRD.

BY C. HART MERRIAM.

Among the mammals obtained on Espiritu Santo Island by Mr. J. E. McLellan, in August, 1895, are three specimens of *Bassariscus* belonging to an apparently undescribed species. The animal is decidedly smaller and grayer than *B. astutus flavus* Rhoads, its nearest known relative, and differs also in cranial and dental characters. It lives among the rocks near the beach, and is said to feed on crabs.

**Bassariscus saxicola** sp. nov.

*Type* from Espiritu Santo Island, Lower California. No. 79031, ♀ old, U. S. Nat. Mus., Biological Survey Coll. Collected August 19, 1895, by J. Ellis McLellan. Original No. 1438.

*General characters.*—Similar to *B. astutus flavus*, but smaller and grayer; tail more slender, with the black rings relatively broader.

*Color.*—Type specimen in summer pelage: Upper parts drab-brown, abundantly mixed along the back with black-tipped hairs; under parts pale ochraceous buffy; tail with 8 or 9 black rings, incomplete on under side; under side with 8 white triangles (the uppermost not well defined); ear: basal, $\frac{2}{3}$ dark; apical, $\frac{1}{3}$ whitish; top of head grizzled; sides of face marked by a dark patch between eyes and nose (including whiskers), and a larger, grizzled patch between eye and ear; cheek below eye and patch over posterior $\frac{1}{2}$ or $\frac{2}{3}$ of eye buffy.

*Cranial and dental characters.*—Skull similar to that of *B. astutus flavus*, but smaller; rostrum narrower; temporal impressions much nearer together; audital bullæ fuller anteriorly, their bases more abruptly rounded antero-externally; anterior nares reaching farther back superiorly; fron-

tals more abruptly elevated above rostrum; postorbital processes more strongly developed; last upper molar decidedly smaller; upper carnassial with inner lobe more rectangular.

*Measurements* (type specimen).—Total length, 737; tail vertebræ, 370; hind foot, 60.

REMARKS ON BASSARISCUS RAPTOR (BAIRD).

Baird's type specimen of *Bassariscus raptor* was killed in the city of Washington, D. C., where it was killing poultry. That it had recently escaped from confinement was shown by the conspicuous collar-mark around its neck, which is still prominent in the dry skin. The specimen is now preserved in the National Museum, and was evidently first kept in alcohol and afterward skinned, as shown by the yellow discoloration of the pelage and by the puckered and hardened condition of the footpads.

I have compared both the skin and skull of this specimen with specimens from northern California and Oregon, and find that they agree closely in all respects, except the interpterygoid fossa, which is abnormally broad in the type specimen. The number and breadth of the black bands on the tail correspond with specimens from Oregon and northern California. The skull is a little larger than that of any Oregon specimen in the Department collection, but is almost exactly matched by a specimen from Glen Ellen, California.

Mr. S. N. Rhoads has renamed *Bassariscus raptor* (Baird), calling it *B. oregonus* (Proc. Acad. Nat. Sci., Philadelphia, 1893, p. 416), but I cannot see any way by which Baird's earlier name can be displaced by a more modern one, unless it can be proved that Baird's animal is not the form from the northwest coast, with which it agrees in every particular. There is a curious inconsistency in Mr. Rhoads' treatment of the species. On page 414 he says that the form from the northwest coast "may require to be varietally distinguished under the name *raptor* Baird, this name doubtless referring to the Pacific coast form, as already explained." Two pages later (p. 416) he says, "the small dark coast form from northern California northward (not of central and southern California) should be made a subspecies of *flavus*. In that case it should be called *Bassariscus flavus oregonus*."

It is of course unfortunate that the type locality of Baird's specimen is not positively known, but Baird's repeated statement that it probably came from California was doubtless based on some information which he did not at the time care to pub-

lish; and the fact that the characters of the specimen, both external and cranial, agree with those of the northwest coast animal, leaves little doubt as to the general locality whence the animal came.

Skulls of *Bassariscus* from Oregon and the coast region of northern California differ from those of the Texas animal in several respects, but the differences are not absolutely constant.

The teeth average smaller, particularly the fourth upper premolar, the crown of which is of the same length as the transverse diameter of the crown of the first upper molar (measured from the notch on the outer side). In Texas specimens the carnassial is usually but not always considerably longer.

In the Oregon animal the postpalatal notch cuts the plane of the last molar, while in the Texas animal it falls short of this plane. The inferior lip of the infraorbital foramen is slightly cut away, so that the foramen may be seen when the skull is looked at from below at right angle to the eye. In the Texas animal the foramen cannot be seen from below, but is distinctly visible from above, while in the Oregon animal it cannot be seen at all from above. This seems like a trivial difference which no one would expect to be constant, but as a matter of fact it is consistently constant in the four skulls of *raptor* examined. In the Oregon animal the postorbital constriction is deeper and the interorbital breadth somewhat less than in *B. a. flavus*.

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PROCEEDINGS

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# NOTES ON THE CHIPMUNKS OF THE GENUS *EUTAMIAS* OCCURRING WEST OF THE EAST BASE OF THE CASCADE-SIERRA SYSTEM, WITH DESCRIPTIONS OF NEW FORMS.

BY C. HART MERRIAM.

Owing to the unfortunate delay in bringing out the first volume of the Death Valley Expedition report, it is thought desirable to publish at once certain descriptions and remarks on Chipmunks that were written for this report in 1893. With these have been incorporated additional notes, and descriptions of two new species, obtained during subsequent explorations by the Biological Survey, both in the area covered by the original expedition and in adjacent territory on the north.

It will be observed that the name *Eutamias*, proposed by Trouessart in 1880* as a subgenus of *Tamias*, is here adopted as a full genus. This is because of the conviction that the superficial resemblance between the two groups is an accidental parallelism in no way indicative of affinity. In fact, the two groups, if my notion of their relationships is correct, had very different ancestors—*Tamias* being an offshoot from the ground

*Catal. Mamm. Viv. et Foss., Rongeurs, 86, 1880. As originally proposed the name included four very different animals: *asiaticus* Gm., *harrisi* Aud. & Bach., *lateralis* Say, and *levidens* Cope (fossil). The fossil *levidens* I have not seen, but *harrisi* was placed by me in *Ammospermophilus* in 1892, and *lateralis* is the type of a very distinct subgenus of *Spermophilus*, which I here name *Callospermophilus*. The type of *Eutamias* was fixed on *Tamias asiaticus* Gm. by Allen in 1894 (Proc. Linn. Soc. N. Y., p. 26, July, 1894).

squirrels of the subgenus or genus *Ictidomys* Allen, and *Eutamias* from those of the subgenus or genus *Ammospermophilus* Merriam.

The substance of the present preliminary paper may be conveniently arranged under the following headings:

1. *General remarks on distribution.*
2. *Seasonal changes in pelage.*
3. *List of species and subspecies.*
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## 1. General Remarks on Distribution.

There are no Chipmunks in the Sonoran deserts of the western United States, but the vast sage-brush plains of the central and northern parts of the Great Basin are inhabited by a small grayish species (*Eutamias pictus*), and other species live in the higher mountain ranges. On reaching the eastern base of the Sierra Nevada in California, and of the Cascade range in Oregon and Washington, one enters the region where the genus *Eutamias* attains its highest development. Excepting the great interior valley of California and one or two small valleys in southwestern Oregon, which are not inhabited by any Chipmunks, the strip of territory included between the east base of the Cascade-Sierra system and the Pacific Ocean may be said to be fairly overrun by these animals, containing not less than 14 species and subspecies. The chaparral-covered hills of southern California and the lower slopes of the mountains that surround the Mohave Desert and the great San Joaquin Valley have only a single species; but the boreal forests that clothe the higher mountains and practically the whole of western Oregon and Washington are the homes of a large number of forms belonging to three or four distinct groups. In the forests west of the Cascade Mts. only a single species occurs (*E. townsendi*), except along the extreme southwestern coast of Oregon, where it is replaced by an allied form (*E. ochrogenys*). On the eastern slopes and higher parts of the Cascade Mts. two species are found together—the small *E. amœnus*, which extends southward on the Sierra Nevada to about latitude 37°, and the large *E. townsendi*, which inhabits the Cascades from British Columbia southward to a point between

latitude 44° and latitude 45°, and is then replaced by *E. senex*, which ranges thence southerly to the headwaters of the Merced, a little south of latitude 38°.

But it is in the Sierra Nevada of California that the genus *Eutamias* reaches its most extraordinary development. On both slopes of this lofty range species of Chipmunks are distributed in belts, one above the other, corresponding with the strongly marked life zones of the slopes. In most parts of the Sierra two species occur together, in some localities three, and in a small area near timber-line in the Yosemite National Park probably four. Since in following the Sierra northward the Boreal zones come lower and lower down, so certain Chipmunks which in the southern part are found only at high altitudes descend in the north till they reach base level at the upper end of the Sacramento Valley.

In crossing the High Sierra between Owens Valley and Fresno one traverses in a distance of only 50 miles the ranges of at least seven very distinct Chipmunks, as follows: On beginning the climb in Owens Valley one finds in the sage-brush the ordinary Great Basin species, *E. pictus;* a little higher up, in the nut pine belt, the most beautiful species of the genus, *E. panamintinus.* Then on entering the Boreal Zone he encounters two very distinct species, *E. amœnus* and *E. speciosus.* Still higher, in the neighborhood of timber-line, he sees for the first time the little Alpine Chipmunk, *E. alpinus*, and a little farther north the large *E. senex.** On descending the west slope he passes through the zone inhabited by *E. callipeplus*, a strikingly beautiful member of the *speciosus* group, and on the lower slope enters the belt in which *E. merriami* is the sole representative of the genus. If the section were made as far north as the Yosemite National Park, two others would be added, *E. senex*, along the summit of the range, and the superb *E. quadrimaculatus*, at lower altitudes on the west slope.

A good deal of work remains to be done in determining the exact boundaries of the areas inhabited by each species, but enough is already known to show that the group presents some very interesting peculiarities of distribution. For instance, *Eutamias alpinus* is distinctly an animal of the Hudsonian Zone of

* Whether or not *E. alpinus* and *senex* actually occur together is not known. *E. amœnus* was not collected by the Death Valley Expedition south of Independence Creek.

the southern High Sierra, and does not reach so far north as Lake Tahoe. *E. amœnus*, on the other hand, is not found so far south as Mt. Whitney, but begins apparently in the latitude of Independence Creek, and ranges thence northward to British Columbia. True *speciosus* seems to be restricted to the east crest of the High Sierra and the San Bernardino and San Jacinto Mts. on the other side of the Mohave Desert.* In the mountains about Lake Tahoe it is replaced by a closely related form, *E. frater*, which does not reach northern California. The large *E. senex* begins near the headwaters of the Merced in the Yosemite National Park and extends northward over the Sierra and eastern slope of the Cascades to a point in Oregon between latitude 44° and latitude 45°, where it is replaced by *townsendi*. *E. townsendi* continues northerly to British Columbia, and on the west side of the mountains reaches southward nearly to Rogue River. South of the mouth of Rogue River it is replaced by an allied form, *E. ochrogenys*, which follows the coast southward almost to San Francisco Bay. This form is restricted to the narrow coast strip known as the 'redwood belt.' Immediately east of this belt its range abuts against that of *E. hindsi*, which latter animal is replaced in the coast ranges south of San Francisco Bay by the allied *E. merriami*. *E. merriami* not only inhabits the coast ranges from San Francisco Bay south to the Santa Ynez Mts., but pushes on in a southeasterly direction along the San Gabriel, San Bernardino, and San Jacinto Mts. to the Cuyamaca Mts., and northeasterly by way of Mt. Piños and Tehachapi Mt. to the west slope of the Sierra, which it follows northward along the lower slopes as far at least as the Yosemite National Park.

## 2. Seasonal Changes in Pelage.

The seasonal color changes in the genus *Eutamias* are startling, the difference in most species between the gray winter coat and the 'red' or bright golden-fulvous post-breeding pelage being almost incredible. In fact, in some instances, the same animal in different pelages has been named as two different species.

Dr. J. A. Allen, in his elaborate and admirable paper on the Chipmunks,† has pointed out the striking color change that takes

* For interesting facts respecting the distribution of members of the *speciosus* group, see pages 199–201.

† Bull. Am. Mus. Nat. Hist., New York, vol. III, No. 1, pp. 45–116, 1890.

place at the close of the breeding season, and in his detailed descriptions of the various species and subspecies has treated the 'breeding' and 'post-breeding' pelages under separate headings; but he remains silent as to what the worn breeding pelage was before it became worn, leaving it to be inferred that it was the left-over summer pelage of the preceding year. In fact, he speaks of only a single molt—that from the worn to the new summer pelage—which commonly takes place in June or July. There is, however, a second complete molt in the fall, usually in September or October, which results in a change of color hardly less remarkable than that of the summer molt. In general terms it may be said that while the change from the breeding to the post-breeding pelage results in a brightening of the tints, with a great increase in the fulvous or tawny colors, the change from summer to winter pelage is the reverse—the bright tawny colors giving place to rich grays and browns. The character of the pelage differs also, the summer coat being relatively short and hispid, while the winter coat is long, full, and woolly.

A remarkable circumstance connected with the change of pelage is that while the winter coat is worn about 9 months, the summer coat is worn only about 3 months, and in some cases for a considerably shorter period. The animals breed while still in the left-over winter pelage, which in early summer is often so worn and faded that it has the appearance of another pelage. In fact, although there are only two molts, it would not be amiss to describe 3 pelages: (1) the fresh fall or winter pelage; (2) the worn summer or breeding pelage [= the left-over winter pelage], and (3) the bright fresh reddish post-breeding pelage.

The change from the summer or 'post-breeding' pelage to the winter coat takes place by complete molt, as in the case of the change from the breeding to the post-breeding pelage; but there is a radical difference, at least in some species, in the way the molt progresses. At the close of the breeding season the animal is usually in worn, shabby pelage, and not infrequently the hairs are worn off so short that the dorsal stripes disappear. The new coat appears in irregular patches,* usually beginning on the head and covering the anterior half of the back next; in other words, while somewhat irregular, it progresses from before backwards. The late fall molt, on the contrary, begins on the rump

*In some specimens the post-breeding pelage seems to creep in insidiously without the usual 'patchy' stage.

and progresses from behind forward, the new hairs coming in uniformly and not in irregular patches as in summer molt. The winter molt succeeds the summer molt so soon that the summer pelage has not had time to become much worn; consequently, at this season, such shabby specimens as those commonly found at the end of the breeding season are unknown.

### 3. List of Chipmunks of California and of Western Oregon and Washington, with Type Localities.*

1. *Eutamias pictus* (Allen).....Kelton, Utah.
2. *alpinus* (Merriam) .....Mt. Whitney, California.
3. *amœnus* (Allen). .....Fort Klamath, Oregon.
4. *panamintinus* (Merriam) Panamint Mts., California.

*Speciosus group:*

5. *Eutamias speciosus* (Merriam).....San Bernardino Mt., California.
6. *frater* (Allen)...Donner, California.
7. *ingoensis* nob...White Mts., California.
8. *callipeplus* (Merriam).....Mt. Piños, California.

*Intermediate between speciosus and townsendi groups:*

9. *Eutamias quadrimaculatus* (Gray)..Michigan Bluff, California.

*Townsendi group:*

10. *Eutamias senex* (Allen).....Donner, California.
11. *townsendi* (Bachman)....Lower Columbia River, Oregon.
12. *ochrogenys* nob. Mendocino, California.
13. *hindsi* (Gray).....Near San Francisco, California.
14. *merriami* (Allen)..... San Bernardino Mt., California.

### 4. Remarks on the townsendi Group.

*Eutamias townsendi* and its relatives are the largest and darkest members of the genus. They inhabit the Pacific coast region from southwestern British Columbia (Westminster and the Mt. Baker range) southward to the Cuyamaca Mts. in extreme southern California; and if, as seems probable, *E. obscurus* is a member of the same series, the range will be extended to San Pedro Martir Mt. in Lower California. No member of the group is known from any point east of the east base of the Cascade-Sierra system. The group comprises five forms, all but one of which seem worthy

*This list does not include the three new extralimital forms described in the present paper (*palmeri*, p. 208; *orcocetes*, p. 207; and *dorsalis utahensis*, p. 210).

of full specific recognition.* Three of the species are Boreal namely, *townsendi*, *ochrogenys*, and *senex*. The remaining two, *hindsi* and *merriami*, belong to the Transition and Upper Sonoran belts. The group may be thus subdivided into two series, the *townsendi* or Boreal series and the *hindsi* or Sonoran series. The principal characters of the five, with the geographic ranges of each, follow. Keys are given also, by means of which it is believed that specimens in any pelage may be referred to their proper species.

**Eutamias townsendi** (Bachman). Townsend's Chipmunk.

*General characters.*—Under parts white at all seasons, moderately encroached upon by color of sides; general coloration uniform dull fulvous in post-breeding pelage, and uniform olive yellowish in winter pelage; post-auricular spots and ear stripes bluish gray, large and conspicuous; sides of face slightly washed with yellowish in winter pelage, more strongly washed with fulvous in post-breeding pelage; *five* dark dorsal stripes *black*, more or less obscured by fulvous or yellowish tipped hairs, but black always showing through; median dorsal stripe longer anteriorly than in any other species, always reaching to and often beyond anterior base of ears; ant-orbital part of middle facial stripe obsolete as in *ochrogenys;* inner pair of light dorsal stripes in both pelages same color as general color of upper parts; outer pair yellower.

*Range.*—Northern Pacific coast region from the southwestern corner of British Columbia (Westminster, Mt. Lehman, Chilliwack, and Mt. Baker range) southward over the whole of western Washington and Oregon to the Rogue River Valley; eastward in the northern Cascades to the east base of the range (head of Lake Chelan); westward to the extreme coast. On the east slope of the Cascades *E. townsendi* crosses the Columbia River and pushes southward a little beyond Mt. Hood. A short distance farther south on this slope it is replaced by *E. senex*.

**Eutamias townsendi ochrogenys** Merriam. Redwood Chipmunk.

*General characters.*—Under parts *never white*, but encroached upon by color of sides in ordinary pelage, and strongly washed with salmon-ochraceous in post-breeding pelage; sides of face suffused with ochraceous in all pelages; post-auricular spots bluish gray, large and conspicuous; anterior part of eye stripe obsolete. (For full description see p. 206.)

*Range.*—A narrow strip along the coast of southern Oregon and northern California, from near the mouth of Rogue River in Oregon to Cazadero, a short distance north of San Francisco Bay, in California.

* It is an interesting fact that most, if not all, of the species have one pelage in which they resemble one pelage of one of the other species, while the other pelage is always distinctive. In some instances it is the winter pelage, in others the post-breeding pelage that is distinctive.

**Eutamias senex** (Allen). Allen's Chipmunk.

*General characters.*—Tail rather short, narrow, and pale fulvous underneath and at base of hairs on upper side; under parts white in both pelages; ear stripes and post-auricular spots sharply defined and conspicuous; general color of upper parts in winter pelage *gray*, in summer *fulvous*, except on head and rump; outer pair of light stripes whitish, inner pair grizzled grayish, in post-breeding pelage obscured anteriorly by fulvous; top of head and *rump grizzled grayish in all pelages*, only slightly more fulvous in post-breeding pelage; ant-orbital part of middle facial stripe only slightly marked; sides of face never suffused with yellowish; dark dorsal stripes obscured by fulvous, the black showing through, particularly on the median stripe.

*Range.*—The Sierra-Cascade system from Farewell Bend on the Des Chutes River in Oregon south to the headwaters of the Merced River in Yosemite National Park. In Oregon *senex* follows the east slope of the Cascade range down to base level, being common at Fort Klamath, as well as at similar elevations farther north. It occurs also at the Paulina Lakes, in the Paulina Mts., which range is connected with the main body of the Cascades by continuity of Boreal forest. The species was found at Prospect, in the Upper Rogue River Valley, and is common also in the Siskiyous along the boundary between Oregon and California. In the Sierra Nevada of central California it is confined to high altitudes, and does not approach base level on either slope. East of the Sierra proper, in Lassen Co., it inhabits the Big Valley Mts.*

**Eutamias hindsi** (Gray). Hinds' Chipmunk.

*General characters.*—General coloration redder than in any other member of the *townsendi* series; under parts white, except in post-breeding pelage, when they are faintly washed with fulvous; ear stripes and post-auricular spots fairly well defined, more conspicuous than in *merriami*, but much less conspicuous than in *townsendi* or *ochrogenys;* general color of upper parts in winter pelage grizzled grayish and dull fulvous; in summer pelage intense ferruginous anteriorly and on sides, becoming pale posteriorly. In winter pelage the dark dorsal stripes, except the median one, are obscured by fulvous, but in post-breeding pelage there are always three distinctly black dorsal stripes, and in some specimens the black shows through in the external lateral stripe. The outer light stripe is whitish, more or less suffused with yellowish in summer pelage; in winter pelage it is bluish gray. In winter pelage the fulvous is most marked on the lateral dark stripes which enclose the outer pair of light stripes, so that the striped effect is much more pronounced in winter pelage than in

*The form from the Big Valley Mts. differs from typical *senex* in having the post-auricular patches and outer pair of light stripes much *whiter*. It is evidently not an intergrade between *senex* and *quadrimaculatus*, but may be regarded as an incipient subspecies, not yet requiring a name.

post-breeding pelage. The hairs of the upper side of the tail have a broad median band of fulvous which shows through in both pelages, giving the tail a rich fulvous glow not present in the other members of the series except—and to a less extent—in *townsendi* in post-breeding pelage.

*Range.*—Wooded or brushy hills of northern California west of the Sacramento Valley and north of San Francisco Bay. Northern limit of range unknown. Specimens have been examined from Nicasio northward to Sherwood, Cahto, and the head of Eel River. On the west the range of *hindsi* joins that of *ochrogenys*.

**Eutamias merriami** (Allen). Merriam's Chipmunk.

*General characters.*—Tail very long; ear stripes and post-auricular spots not sharply defined and not conspicuous; under parts white; general color of upper parts grayish in winter pelage, fulvous in summer pelage; outer pair of light stripes whitish and always conspicuous; dark dorsal stripes obscured by fulvous-tipped hairs, the median one only showing any clear black; sides of face never washed with yellowish or ochraceous; median facial stripe continuous in front of eye, usually dusky, bordered on both sides by fulvous; inner pair of pale dorsal stripes grizzled grayish.

*Range.*—Brush-covered slopes of the Upper Sonoran and Transition zones in southern California from the Cuyamaca, San Jacinto, and San Bernardino Mts. northward in the coast ranges to San Francisco Bay, and along the west slope of the Sierra to the Yosemite Valley. In the San Bernardino Mts. *merriami* occurs as far west as Wilson Peak, beyond which it is separated by a considerable gap from Mt. Piños, where it is abundant. Owing to the low altitude it inhabits, its range is practically continuous around the southern end of the San Joaquin Valley, specimens having been collected on Tehachapi Mt. and at Havilah near Walker Basin. The colonies inhabiting the Cuyamaca, Smith, San Jacinto, and San Bernardino Mts. are isolated. The form inhabiting the coast strip between Santa Cruz and San Francisco Bay is a little more highly colored than the typical animal, and has been named *pricei*.

Key to Members of Townsendi Group in all Pelages.

Ear stripes and spot behind ear well defined; tail not exceedingly long.
  *Under parts white* (not washed with fulvous).
    Upper parts (excepting stripes) of *uniform* color from post-auricular spots to tail.
      Color yellowish olive-gray (winter pelage) or dull yellowish fulvous (post-breeding pelage).....*townsendi*.
    Upper parts *not* of uniform color.
      Rump grizzled gray; tail small, narrow, dull fulvous below. .... .....*senex*.
      Rump grizzled golden-brown; tail large and bushy, deep chestnut below.....*hindsi*.

*Under parts not white* (washed with fulvous).
3 dorsal dark stripes black; stripe from nose to ear distinct; side of face not suffused with yellowish (summer pelage).....*hindsi.*
3 dorsal dark stripes not black; stripe from nose to ear absent; sides of face strongly suffused with yellowish.....*ochrogenys.*
Ear stripes and spot behind ear not well defined; tail exceedingly long.....*merriami.*

KEY TO MEMBERS OF TOWNSENDI GROUP IN ORDINARY PELAGE.

Tail exceedingly long; ear stripes and post-auricular spots indistinct.
General color grayish.....*merriami.*
Tail not exceedingly long; ear stripes and post-auricular spots conspicuous.
Rump and general ground color *clear light gray;* dark stripes rusty; flanks bright ochraceous fulvous.....*senex.*
Rump and general ground color *not gray;* dorsal stripes not rusty (except in *hindsi*).
Under parts suffused with fulvous and strongly encroached upon by color of sides; sides of throat and face strongly suffused with fulvous.
General color rich dark grizzled olive-gray.....*ochrogenys.*
Under parts white, not encroached upon by color of sides; sides of throat not suffused, and face only slightly suffused with fulvous.
General color *uniform* yellowish olive-gray, including flanks and rump; all 5 dark stripes showing more or less black; outer pair of light stripes *broad*, pale yellowish, becoming grayish with wear.....*townsendi.*
General color *not* uniform and *not* yellowish olive gray; flanks bright fulvous, becoming pale with wear; dorsal stripes rusty, the median one (and sometimes the inner lateral pair) showing black along middle; outer pair of light stripes narrow, whitish.....*hindsi.*

KEY TO MEMBERS OF TOWNSENDI GROUP IN REDDISH POST-BREEDING PELAGE.

*Tail exceedingly long.*
Ear stripes and post-auricular spots not sharply defined; outer pair of light stripes whitish; inner pair grizzled gray.....*merriami.*

*Tail not exceedingly long.*

Upper parts with *at least 3 dorsal stripes distinctly black.*

Ground color of upper parts (including flanks and inner pair of light stripes) *uniform* dull yellowish fulvous from neck to tail; outer pair of light stripes slightly yellower and very broad; external lateral dark stripe showing black (making 5 stripes showing black); ear stripes and post-auricular spots sharply defined and very conspicuous. . . . . *townsendi.*

Ground color of upper parts *not* uniform; flanks and fore part of back rich ferruginous; outer pair of light stripes whitish, more or less washed with fulvous, and narrow; external lateral stripe rusty; ear stripe and post-auricular spots only moderately defined. . . *hindsi.*

Upper parts with *only one dorsal stripe (the median) distinctly black.*

Top of head and rump grizzled gray; outer pair of light stripes whitish; inner pair grizzled gray; *under parts white;* under side of tail *dull fulvous*. . . . . *senex.*

Top of head and rump grizzled fulvous or golden-fulvous; outer pair of light stripes grizzled grayish, inner pair yellowish-fulvous; *under parts strongly suffused with salmon-fulvous;* under side of tail *deep rich chestnut* . . . . . *ochrogenys.*

### 5. Remarks on the speciosus Group.

The *speciosus* group is of hardly less interest than the *townsendi* group, from which it differs totally in appearance. The members of the *townsendi* series are large and dark, with relatively dull stripes; those of the *speciosus* series are decidedly smaller and lighter, with very bright stripes. Most members of the *townsendi* group have become differentiated into full species, while those of the *speciosus* group (except *palmeri*, which is separately described) are still only subspecies. The *townsendi* group, as already shown, has both Boreal and Transition representatives; those of the *speciosus* group are purely Boreal, inhabiting the Hudsonian and Canadian zones from timber-line down to the lower limit of spruce and firs. Their distribution therefore is not continuous, but takes the form of isolated colonies occupying the summits of the higher mountains from San Jacinto Peak, in southern California, northward to the neighborhood of Donner, a little north of Lake Tahoe. The exact northern limit is unknown, but the group does not reach the mountains of northern California. The mountains on which members of the group are

known to occur are San Jacinto, San Bernardino, Mt. Piños, the Inyo and White Mts., and the High Sierra. The type locality of the species is Mt. San Bernardino, and the typical form occurs also on San Jacinto Peak, and on the eastern crest of the southern part of the High Sierra in the neighborhood of Mt. Whitney. Owing to the high altitudes it inhabits, its range is nowhere continuous except in the High Sierra.

Curiously enough, the northern form in the Sierra (neighborhood of Donner and Lake Tahoe) differs very appreciably from typical *speciosus* and may be known as subspecies *frater* (Allen).

The form from the White and Inyo Mts. is also subspecifically separable and may be known as *inyoensis* nob.

The form inhabiting the summit of Mt. Piños is still different and may be known as subspecies *callipeplus* (Merriam). A closely related form, differing so little that it is included under the same name, inhabits the western crest of the southern Sierra.

In studying the distribution of these Chipmunks it is interesting to observe that with the single exception of Mt. Piños the mountains which encircle the west end of the Mohave Desert are too low to furnish a home for any member of the group, so that the colony of subspecies *callipeplus* inhabiting Mt. Piños is separated widely not only from the nearest colony of typical *speciosus*, but also from the nearest part of the range of the Sierra colony of its own subspecies.

Recapitulating, it appears that there are four forms of *speciosus* which seem worthy of recognition by name: (1) *speciosus* proper, inhabiting the San Jacinto and San Bernardino Mts. and the eastern crest of the High Sierra from Olancha Peak and Mt. Whitney northward an unknown distance, but not reaching the headwaters of the San Joaquin river; (2) *callipeplus*, inhabiting the summit of Mt. Piños and the western slope of the Sierra from the headwaters of Tule river northward nearly to the Yosemite Valley; (3) *inyoensis*, inhabiting the higher parts of the Inyo and White Mts., and (4) *frater*, inhabiting the higher parts of the main Sierra in the Lake Tahoe region of central California.

It is difficult to understand why there should be three recognizable forms within a distance of 150 miles in the Sierra Nevada while two of these forms reappear on isolated mountains 100 and 150 miles south of the southernmost limit of their ranges in the Sierra. This seems the more remarkable since in the Sierra the

two forms in question—*speciosus* and *callipeplus*—are separated, if at all, by a gap only 15 miles in width.

In view of these facts it is important to bear in mind that the southern part of the lofty Sierra is split lengthwise by the upper valley of Kern River into two parallel ridges, one of which (the eastern) is inhabited by true *speciosus*, the other (the western) by *callipeplus*. It should be remembered also that the Mt. Piños colony of *callipeplus* lies southwest of the Sierra colony, and that the San Bernardino Mt. colony of *speciosus* lies southeast of the Sierra colony of the same form. These facts, taken in connection with the close relationship of *speciosus* with *quadrivittatus* of Colorado, point to the former continuous range of the group across the south end of the Great Basin from the Rocky Mts. to the Sierra, San Bernardino Mt., and San Jacinto Peak; while the presence of a distinct form (*callipeplus*) on Mt. Piños at the extreme west end of the Mohave Desert and on the western range of the Sierra not only points to a former connection between the now separated colonies of this form by way of Tehachapi and the intervening low mountains, but also seems to show that the two existing colonies of true *speciosus* now separated by the Mohave Desert were never united—unless in very remote times—by continuity of range along the horseshoe of mountains which connect the San Bernardino range with the Sierra. These facts argue great antiquity for the *speciosus-quadrivittatus* type and seem to show that very little change has taken place during the many thousands of years that have elapsed since the climate was cool enough to admit of continuity of Boreal forest across what are now the torrid Sonoran deserts of eastern California, southern Nevada, and southwestern Utah. This view receives additional support from the large amount of differentiation undergone by the colonies of clearly derivative forms of these animals now stranded on isolated mountains within the area of former continuous range of *quadrivittatus-speciosus* across the southern part of the Great Basin. These forms are the subspecies *inyoensis* of the Inyo and White Mts., and the very distinct species *palmeri* of the Charleston Mts., both of which must have developed their distinctive peculiarities since the great change in climate took place. And it is interesting to note that the degree of differentiation of these forms is proportionate to the climatic isolation of their homes.

*Characters of the 4 subspecies of Eutamias speciosus.*

*Eutamias speciosus* (Merriam) is the smallest and shortest-tailed member of the series. In ordinary pelage it is the *grayest* of the group, and in all pelages the tail is *deep rich fulvous* above and below, and the fulvous of the upper surface is only partly hidden by the black tips of the hairs. The facial stripes are strongly marked and the post-auricular patches whitish and well defined.

*Eutamias speciosus frater* (Allen) is considerably larger than true *speciosus;* the fulvous of the sides (below the external-lateral stripe) is brighter and more extensive: the tail, particularly the upper side, is paler fulvous, the black tip is shorter, and the edges and tips of hairs on the upper surface are grayish instead of deep yellow.

*Eutamias speciosus inyoensis* (nob.) is about the same size as *frater* and has the longest tail of any member of the group. The black tip of the tail is short, like that of *frater*, but the fulvous of the upper side is much deeper and richer. The subspecies differs from all others in having the facial stripes less pronounced, the post-auricular patches indistinct, the back of the neck *largely gray*, the median dorsal stripe *black*, and the inner pair of light stripes grayish white. It agrees with *callipeplus* and differs from all the others in having the rump grizzled golden yellowish instead of gray.

*Eutamias speciosus callipeplus* (Merriam) is the largest of the group. It agrees with *inyoensis* and differs from all the others in the grizzled golden yellow (instead of gray) of the rump, and the unusual amount of bright rufous in the upper side of the tail. The whitish post-auricular patches are larger and more clearly defined, and the yellow edging of the tail more extensive than in any of the others. In the typical form (from Mt. Piños) the black tip of the tail is short; in the Sierra form it is long—and this is the only difference I am able to detect between the two colonies. We have no specimens from Mt. Piños in post-breeding pelage, but specimens in this pelage from the west slope of the Sierra differ from *frater* in the same pelage in having the post-auricular patches better defined; the dark facial stripes darker and sharper and the white ones whiter; the inner pair of light dorsal stripes more obscured by fulvous; the rump yellower; the ears longer; the tail larger and more bushy, edged with *deep yellow* instead of grayish or pale yellowish, with the upper surface very much deeper and richer fulvous. *Eutamias speciosus callipeplus* in post-breeding pelage resembles *E. quadrimaculatus* in corresponding pelage, but differs in smaller size, shorter ears, very much brighter tints; in smaller, grayer, and less sharply defined post-auricular patches; broader external white dorsal stripes; blacker ant-orbital part of eye stripe; and yellowish instead of hoary tips to the hairs on the upper side of the tail.

## 6. Note on 'Tamias quadrimaculatus' Gray.

**Eutamias quadrimaculatus** (Gray). Long-eared Chipmunk.

*Tamias quadrimaculatus* Gray, Ann. & Mag. Nat. Hist., 3d ser., XX, 435, 1867; Allen, Bull. Am. Mus. Nat. Hist., III, 80–82, 1890.
*Tamias macrorhabdotes* Merriam, Proc. Biol. Soc., Wash., III, 25–28, Jan. 27, 1886; Allen, Bull. Am. Mus. Nat. Hist., III, 78–80, 1890.

The material necessary for the final determination of the status and interrelations of the large Chipmunks of the Sierra Nevada was collected by the Death Valley Expedition. The names that have been given to these species are *Tamias quadrimaculatus* Gray (1867), *T. macrorhabdotes* Merriam (1886), *T. merriami* Allen (1889), and *T. senex* Allen (1890). *T. merriami* is a very distinct species from the one under consideration, and need not be discussed in the present connection. (See p. 197.)

*Tamias quadrimaculatus* was described by Gray in 1867 from a specimen from Michigan Bluff on the west slope of the Sierra in Placer County, California. This specimen is in the red post-breeding pelage, as shown by the original description and by a note from Mr. Oldfield Thomas, published by Dr. J. A. Allen (Bull. Am. Mus. Nat. Hist., III, p. 82, June, 1890). The species was not recognized by Baird, and Allen, in his Monograph of the Sciuridæ (1877), gave it as a synonym of *townsendi*.

In 1886 I described, under the name *Tamias macrorhabdotes*, a long-eared and strikingly colored Chipmunk from Blue Cañon in the Sierra Nevada of central California. At this time no specimen of Gray's *quadrimaculatus* was available for comparison, the only specimen extant (the type) being in the British Museum. Subsequently I came in possession of a single specimen in rather poor pelage from Nevada City, California, which differed from the specimens of *macrorhabdotes* from Blue Cañon (the type locality) in having considerably smaller and less distinctly striped ears, smaller post-auricular spots, the shoulders, anterior half of the back, and flanks deeply suffused with intense ferruginous, and the hind feet of the same color, though duller. This specimen was correctly identified by both Doctor Allen and myself as Gray's *quadrimaculatus*. Owing to the differences just mentioned, Doctor Allen, in his revision of the species of the genus *Tamias*, concurred with me in admitting Gray's *quadrimaculatus* and my *macrorhabdotes* as different species.

In addition to the material available when Dr. Allen wrote

his revision of the group, large series of specimens are now before me from the three localities involved, namely, Nevada City, Michigan Bluff (the type locality of *quadrimaculatus*), and Blue Cañon (the type locality of *macrorhabdotes*). The Nevada City specimens alone are sufficient to settle the question. Some of them have just attained the post-breeding or summer pelage; others are in the worn breeding pelage, and others still are immature. Those in the fresh summer pelage agree with the specimen above described from the same locality, except that the ears and post-auricular spots are decidedly larger. Specimens in worn breeding pelage, however, are quite different, having merely a suspicion of the rich rusty color on the back and shoulders, and the rusty of the hind feet much less pronounced. These specimens, in fact, agree with specimens of *macrorhabdotes* from Blue Cañon in corresponding pelage. Furthermore, to put the matter beyond dispute, a series of specimens was obtained by the expedition from Michigan Bluff, the actual type locality of Gray's *quadrimaculatus*. They were collected in the latter part of October by Mr. Vernon Bailey, and agree in every particular with October specimens from Blue Cañon, the type locality of *macrorhabdotes*. They agree also with the Nevada City specimens in breeding pelage, except that the colors are a little deeper, the coat being new instead of worn. It is obvious, therefore, that *quadrimaculatus* Gray and *macrorhabdotes* Merriam are one and the same animal—the former in summer, the latter in fall pelage.*

The much greater development of ferruginous on the original Nevada City specimen and on the additional specimens in summer pelage more recently obtained from the same locality is purely a seasonal character, pertaining to the short-lived summer pelage. The October specimens of '*macrorhabdotes*' then available for comparison were believed by both Doctor Allen and myself to be in the post-breeding or summer pelage, and therefore strictly comparable with the Nevada City specimen—the late fall or winter pelage not having been recognized at that time in this or any other species of the genus.

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* Doctor Allen states that he was at first inclined to regard the two as identical, and Mr. Oldfield Thomas, Curator of Mammals in the British Museum, who compared a Blue Cañon specimen with Gray's type, wrote on the back of the label: "Certainly identical with the type of *T. quadrimaculatus* Gr., which only differs by more yellowish and less sharply defined underside and more fulvous flanks and shoulders."—Bull. Am. Mus. Nat. Hist., III, June, 1890, 82.

The summer pelage is of very brief duration, and a reëxamination of the original Nevada City specimen (collected in October, 1872, by E. W. Nelson) shows that it had already begun to assume the winter pelage, which is fully developed on the tail and rump, the deep rusty back of the summer pelage remaining in sharp contrast. In August specimens from Nevada City the rusty of the back reaches farther posteriorly.

All of the original specimens from Blue Cañon described by me as *macrorhabdotes* and also those described later by Doctor Allen were collected in June and October—the latter in winter pelage, the former in breeding pelage, which is the winter pelage with the tips of the hairs worn off. Neither of us, as already remarked, had seen the summer pelage, though at that time we believed the October specimens to be in this pelage.

The original Nevada City specimen had abnormally short ears, and the ear stripes were indistinct and quite different from those of the original Blue Cañon specimens, the whole of the dark stripe, covering the anterior two-thirds of the ear, being obscured by rusty. Examination of the additional material now available shows that the full development of the ear stripes is a seasonal character and is only attained in the winter pelage. In this pelage the posterior third of the ear is clear blue-gray, sharply defined by a stripe of blackish which occupies the anterior two-thirds, and is margined with rusty in front only. In summer pelage the rusty spreads over the whole of the dark stripe, obscuring it and giving the ear a wholly different appearance. The outer pair of pale dorsal stripes is whiter in summer than at any other season.

The excessive length of the ears, which adds much to the remarkable appearance of the animal, is most pronounced in the Blue Cañon specimens. The ears are nearly as long in the Michigan Bluff specimens and only slightly shorter in those from Nevada City.

In some respects *Eutamias quadrimaculatus* seems to hold an intermediate position between *callipeplus* of the *speciosus* group and *senex* of the *townsendi* group, but in reality it is not intermediate. The particulars in which it differs from *callipeplus* have been stated (p. 202). In post-breeding pelage it resembles *senex*, but it differs from *senex* in the following points: ear larger and longer; white face stripe, ear stripe, post-auricular patches, and outer pair of white dorsal stripes whiter; dark facial stripes

darker; tail more strongly fulvous, particularly on upper surface. In *quadrimaculatus* the lower cheek stripe is usually dusky, at least posteriorly, and reaches backward behind the plane of the ear; the post-auricular patches are larger than in *senex*, and are pure white instead of bluish gray; the eye stripe is usually blackish both behind and in front of the eye; the outer pair of dorsal stripes are almost as white as in *speciosus*, though not so broad.

The geographic range of *E. quadrimaculatus* is a narrow belt along the lower part of the west slope of the Sierra Nevada from the Yosemite National Park northward to Quincy, in Plumas County. In its relations to other forms, it lies below the range of *senex* and seems to replace *merriami* on the lower slopes north of the Yosemite.

## 7. Descriptions of New Species and Subspecies.

**Eutamias townsendi ochrogenys** subsp. nov. Redwood Chipmunk.

*Type* from Mendocino, California, No. 67182, ♂ ad., U. S. Nat. Mus., Biological Survey Coll. Collected July 17, 1894, by J. E. McLellan. Original No. 1015. (In change of pelage: anterior half of body in fresh post-breeding coat.)

*General characters.*—Size large; general coloration dark and rich; post-auricular spots and ear stripe bluish gray, large and conspicuous; *side of face ochraceous in all pelages;* color of sides *extending far down on underparts* except in post-breeding pelage when the under parts are *strongly washed with salmon-ochraceous;* ant-orbital part of middle dark facial stripe obsolete. Resembles *merriami* in corresponding pelages, but differs in uniformly darker coloration, more conspicuous ear stripes and post-auricular spots, presence of ochraceous suffusion on underparts and sides of face, and absence of ant-orbital part of middle dark face stripe. Differs from *townsendi* in all pelages by color of underparts, which is always white in *townsendi*, and by different colors of upper parts.

*Color.*—*Winter pelage* (in spring and early summer, before replaced by post-breeding pelage): upper parts rich olive, finely grizzled with gray and golden, and becoming dull fulvous on sides; dorsal dark stripes black, more or less obscured by fulvous-tipped hairs; inner pair of light stripes only faintly paler than general ground color of upper parts; outer pair of light stripes grayish; post-auricular spot and posterior ear stripe bluish gray and sharply defined; rest of ear dusky or blackish; becoming more and more fulvous as summer advances; sides of face, including stripes, suffused with ochraceous, increasing in intensity and area as the season advances; fore and hind feet olive gray slightly tinged with pale fulvous, the fulvous increasing in summer; tail above blackish with hoary tips; below rich chestnut with broad submarginal black band.

*Post-breeding pelage:* upper parts fulvous, brightest and richest on sides, becoming paler and duller on rump; dark dorsal stripes much redder than in winter pelage, the median one only showing any clear black; inner pair of light stripes also suffused with fulvous; outer pair grayish; face (sometimes including nose), anterior and inner part of ears, under parts, and fore and hind feet strongly suffused with fulvous.

*Measurements.—Type specimen:* total length, 261; tail vertebræ, 113; hind foot, 38. Average of 8 specimens from type locality: total length, 263; tail vertebræ, 115.5; hind foot, 38.5. Average of 18 specimens from Cazadero and Gualala, California: total length, 260.5; tail vertebræ, 111.6; hind foot, 38.5.

*Remarks.*—In post-breeding pelage *E. ochrogenys* assumes a fulvous pelage, which while differing conspicuously from the corresponding pelage of *hindsi* is very much more like *hindsi* in worm spring pelage. In fact, except for the dates on the labels it would be hard to tell from the color whether certain specimens were the redwood Chipmunk in post-breeding pelage or *hindsi* in spring pelage. Of course the post-breeding pelage is fresher and less worn, and carries with it a salmon-fulvous suffusion on the belly which is much less extensive in *hindsi*. In some specimens of *hindsi* in summer pelage the fulvous of the sides washes across the belly, but this wash is much less extensive and less intense than in the redwood animal. There is also a difference in the color of the upper parts, although this is sometimes hard to be sure of. The post auricular patches are whiter than in *hindsi*, and the inner pair of light stripes are more strongly suffused with yellowish. All of the stripes are shorter posteriorly, so that the unmarked area of the rump is more extensive than in *hindsi*.

Contrasting specimens in corresponding pelage, there is no difficulty in separating the two animals. *E. hindsi* in summer pelage is a very red Chipmunk, and the upper parts, particularly from the back of the neck to the lumbar region, are very bright rich fulvous. In *hindsi*, moreover, in post-breeding pelage the three dorsal dark stripes are *black*, and even the external lateral stripe is distinctly marked, though washed with fulvous. In the redwood animal the dark stripes are never black, and the external lateral stripe is nearly obsolete.

**Eutamias oreocetes** sp. nov. Timber-line Chipmunk.

*Type* from timber-line near Summit, Teton Mts. [main range Rocky Mts.], Montana. No. 72468, ♀ ad. (nursing). U. S. Nat. Mus., Biological Survey Coll. Collected June 14, 1895, by Vernon Bailey. Orig. No. 5024.

*General characters.*—In spring pelage similar in color and general appearance to *Eutamias minimus* and *alpinus*, which very distinct species bear a surprisingly close superficial resemblance to one another; dorsal stripe longer, broader, and blacker than in either *minimus* or *alpinus*, in this respect resembling the larger *affinis* in spring pelage.

*Color.*—Type in spring pelage [= left-over winter pelage]: upper parts gray with a buffy yellowish suffusion on flanks and on side of neck just in front of foreleg; post-auricular spots whitish; top of head grizzled

grayish, dorsal stripe from between ears to tail *black;* lateral dark stripes black, the hairs tipped with rusty; inner pair of pale stripes whitish; outer pair white; rump gray; feet whitish; tail above, grizzled buffy yellowish; below, pale fulvous with black submarginal band edged with buffy ochraceous.

*Cranial characters.*—The skull of *Eutamias orecoetes* is so much smaller than that of its geographical neighbor, *E. affinis*, that no detailed comparison is required. Contrasted with the skull of *E. alpinus* from the High Sierra of California, the skull is slightly larger, the frontals decidedly narrower between orbits; parietals longer; rostrum blunter and much more swollen; teeth disproportionally larger, especially the molars.

*Measurements.*—Type specimen, ♀ ad.: total length, 193; tail vertebræ, 90; hind foot, 31. *Cranial measurements:* basal length, 26; zygomatic breadth, 18; palatal length, 15.5; upper molar series on crowns, 5.

**Eutamias speciosus inyoensis** subsp. nov. Inyo Chipmunk.

*Type* from White Mts., Inyo Co., Calif. No. $\frac{29387}{41462}$, ♂ yg. ad. U. S. Nat. Mus., Biological Survey Coll. Collected July 7, 1891, by E. W. Nelson. Original No. 1069.

*Geographic distribution.*—Boreal summits of White and Inyo Mts., California.

*General characters.*—Similar to *E. speciosus*, but facial stripes less pronounced; post-auricular patches ill defined; rump grizzled golden yellowish instead of gray; middle dorsal stripe blacker; gray on back of neck more extensive; black tip of tail shorter.

*Color.*—Type (July 7): top of head grizzled grayish; dorsal stripe from between ears to base of tail black, faintly edged with rusty along middle of back; lateral dark stripes rusty anteriorly, becoming black edged with rusty on posterior half; outer pair of light stripes white; inner pair gray; sides, from in front of foreleg to rump, bright fulvous; back and sides of neck grayish white, the post-auricular spots indistinct; rump golden yellow, grizzled by black hairs; upper surface of hind feet fulvous; fore feet washed with pale fulvous; tail above, grizzled yellowish-ochraceous and black; below, fulvous with submarginal black band.

*Measurements.*—Type: total length, 225; tail vertebræ, 102; hind foot, 34. Average of 4 specimens from type locality: total length, 227; tail vertebræ, 100; hind foot, 33.3.

**Eutamias palmeri*** sp. nov. Palmer's Chipmunk.

*Type* from *Charleston Peak, Nevada* (altitude about 2450 meters or 8000 feet). No. $\frac{26075}{33481}$, ♂ ad., U. S. National Museum, Biological Survey Coll. Collected by T. S. Palmer and E. W. Nelson Feb. 13, 1891. (Original No. 432.)

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*Named in honor of Dr. T. S. Palmer, who was in command of the expedition during my absence, and who was in charge of the party that visited Charleston Peak and discovered the species.

*General characters.*—*Eutamias palmeri* resembles *E. dorsalis* in size and in the pallid grayish color of the upper parts in winter pelage, but differs in having the stripes more distinct, and in other particulars. In size it agrees very well with typical *quadrivittatus*, though the body is a little larger and the tail a little shorter, but it differs radically from *quadrivittatus* in coloration, resembling *panamintinus* much more closely, though differing in having the upper side of the tail black, and in other respects. Its real affinities are with the *quadrivittatus* group, as shown by cranial characters. The ears are rather small. The dorsal stripes are short at both ends, except the median one, which reaches the occiput. In the clear gray of the neck it resembles the pigmy *E. pictus*.

*Color.*—*Winter pelage:* upper parts gray; no fulvous on back of neck; flanks suffused with pale fulvous; light stripes hoary gray, the outer pair whitish; the three dark dorsal stripes pale ferruginous, the middle one blackish or umber along the median line; outer pair of dark stripes obsolete; facial stripes faintly developed, the lower (cheek) pair failing anteriorly; post-auricular spots dull whitish and not well defined; ear stripes distinct, the posterior dull bluish-white; the anterior dusky, edged along the anterior base with fulvous; feet grayish, faintly suffused with fulvous. Tail: upper side black for three-fourths its length (the base grayish), the extreme tips of the hairs on the base and sides (except the terminal part which is solid black) yellowish; under surface rufous, bordered with black, and edged on the sides only with yellowish.

Summer pelage unknown.

*Cranial and dental characters.*—Skull slightly larger than that of *quadrivittatus*, with larger audital bullæ, and larger and heavier molar teeth, both above and below. The lower premolar is longer and narrower anteriorly than in *quadrivittatus*, and the last lower molar is broader.

*Measurements of type specimen* (taken in flesh).—Total length, 219; tail vertebræ, 98; hind foot, 33. Average measurements of 13 specimens from type locality: total length, 219.3; tail vertebræ, 93.4; hind foot, 33.3.

*General remarks.*—Palmer's Chipmunk has one of the most restricted ranges of any known mammal, being confined to the boreal summit of Charleston Peak—a lofty isolated mountain in southern Nevada. This mountain is completely surrounded by arid deserts which prevent the spread of the species as effectually as an ocean. Though *Eutamias palmeri* bears points of resemblance to several species it is not closely related to any. Still it was evidently derived from the *quadrivittatus-speciosus* stock. The complete isolation of the mountain peak on which it lives sufficiently explains its peculiarities.

Dr. Palmer has given me the following memorandum respecting the place where his chipmunk was obtained. He says: "Thirteen specimens of this species were secured at an altitude of about 8,000 feet on the northwest side of Charleston Peak, where Mr. Nelson and I camped for two days, Feb. 12-14, 1891, in the bottom of a deep east and west cañon. At this time snow lay on the ground to the depth of a foot or more in the bottom of the cañon and covered the upper parts of the main ridge of the Charleston Mountains, but on the north slope of the cañon there was little

or no snow. The timber in the cañon was composed mainly of yellow pines (*Pinus ponderosa scopulorum*), which formed a belt extending at least 1,000 feet above the altitude of camp. On the north side of the cañon *Pinus monophylla* and *Juniperus californica utahensis* were the characteristic trees and here reach their highest altitude, owing to the effects of slope exposure.

"The chipmunks were abundant during the warm part of the day, running along the logs and in open spaces on the sunny north side of the cañon. Nearly all the specimens were taken within a mile of camp. On the 13th of February an ascent was made of the main ridge northwest of Charleston Peak, but no chipmunks were seen more than 1,000 feet above the camp, doubtless owing to the snow and cold."

**Eutamias dorsalis utahensis** subsp. nov. Utah Cliff Chipmunk.

*Type* from Ogden, Utah. No. $\frac{47578}{5448}$, ♂ ad., Merriam Collection. Collected by Vernon Bailey Oct. 9, 1888. Original No. 289.

*General characters.*—Similar to *E. dorsalis*, but slightly smaller and paler, with all of the markings less distinct, particularly the post-auricular patches and facial stripes; under side of tail fulvous instead of rufous.

*Color.*—*Winter pelage:* Upper parts hoary buff, darker on the top of the head, which is grizzled from the admixture of rusty hairs, suffused with pale fulvous on the sides; post-auricular spots small, indistinct, and pale buffy; dorsal stripes nearly obsolete, the median only being noticeable in ordinary lights; facial stripes distinct, but pale and pallid contrasted with those of typical *dorsalis;* under side of tail fulvous, bordered with black and edged with yellowish.

*Summer pelage:* Similar, but paler and more hoary from bleaching of the old hairs. In the young all of the stripes are distinct.

*Cranial characters.*—The skull of subspecies *utahensis* differs from that of typical *dorsalis* in smaller size, conspicuously shorter rostrum, and smaller teeth. The length of the nasal bones is conspicuously shorter than the combined length of the basioccipital and basisphenoid. In *E. dorsalis* the length of the nasals equals or exceeds the occipital-sphenoid length.

*Measurements of type specimen* (taken in flesh).—Total length, 220; tail vertebræ, 97; hind foot, 33. Ear from notch, 16 (in dry skin). Average of 10 specimens from type locality: total length, 223.6; tail vertebræ, 102; hind foot, 32.9.

*General remarks.*—The type specimen of '*Tamias dorsalis*' Baird,* came from the Silver mines in the Mimbres or Piños Altos Mountains, about the sources of the Gila River in western New Mexico. Mr. Clark P. Streator was sent to the type locality late in November, 1892, and obtained 17 specimens in fresh winter pelage. The contrast between these specimens and the

**Tamias dorsalis* Baird, Proc. Acad. Nat. Sci., Phila., VII, 332, 1855.

series of *utahensis* in corresponding pelage from the east base of the Wasatch Mountains in Utah is most striking. In typical *dorsalis* the post-auricular spots are white and much larger and more sharply defined than in *utahensis*. They are bordered below by chestnut, a continuation of the lower facial stripe. All of the facial stripes are broad, sharply defined, and highly colored. The under side of the tail is deep chestnut—in some specimens bright orange-rufous—instead of fulvous, as in *utahensis*. The upper parts also are somewhat darker. The difference between summer and winter pelages seems to be much greater in *dorsalis* than in *utahensis*. The two forms would undoubtedly have been separated before if any recent mammalogist had seen typical specimens of both; but until the present series was obtained from the type locality the typical form was practically unknown.

The difference in size between the two forms is marked, *dorsalis* being much the larger, as may be seen by reference to the accompanying average measurements of specimens from the type localities of both:

*Average measurements of Eutamias dorsalis and E. dorsalis utahensis from type localities (measured in flesh).*

| Species. | Locality. | No. of specimens. | Total length. | Head and body. | Tail vertebræ. | Hind foot. |
|---|---|---|---|---|---|---|
| *Eutamias dorsalis*.. | Piños Altos Mts., N. Mex. | 14 | 236.3 | 128.6 | 107.7 | 35.4 |
| *Eutamias dorsalis utahensis.* | Foot of Wasatch Mts., near Ogden, Utah. | 10 | 223.6 | 121.6 | 102 | 32.9 |

*Eutamias dorsalis utahensis* was obtained by the Death Valley Expedition in but a single locality, namely, the Beaverdam Mountains in the extreme southwestern corner of Utah, where several were seen in rocky places in the piñon belt at an altitude of 1200 to 1375 meters (4000–4500 feet). They were so shy that only one was secured, although Mr. Bailey and I spent several hours in watching the rock heaps into which they had disappeared.

Two years later (in 1893) I found the species in the so-called 'San Francisco' or 'Horn Silver' Mts., between the south end

of Sevier Lake and the mining camp of Frisco, in southwestern Utah.

The Cliff Chipmunk (including both *E. dorsalis* and subspecies *utahensis*) is restricted so far as known to the Upper Sonoran and Transition Zones along the western and southern part of the Great Colorado Plateau and its outliers, where it ranges from the foot of the Wasatch Mountains in northeastern Utah southward as far as the Plateau extends in Arizona, and thence easterly to the Mimbres in the Piños Altos Mountains in western New Mexico. Apparently the range of *utahensis* is much more extensive than that of the typical form, since specimens from eastern Arizona are intergrades, and those from western Arizona and southeastern Nevada are nearly typical *utahensis*.

The name 'Gila Chipmunk,' commonly applied to *E. dorsalis* is a glaring misnomer, since it implies that the species inhabits the valley of the Gila, one of the hottest and most arid of the torrid Lower Sonoran Deserts. As a matter of fact it never enters this desert at all, but lives in a higher zone, under widely different conditions. The early use of the name Gila Chipmunk is due to the circumstance that the original specimen came from the mountains near the headwaters of the Gila River. Since the species always lives among rocks, and its favorite haunts are cañons and the faces of precipitous cliffs, the appropriate name *Cliff* Chipmunk is here given it in place of the old misleading one.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# DESCRIPTIONS OF EIGHT NEW POCKET GOPHERS OF THE GENUS *THOMOMYS*, FROM OREGON, CALIFORNIA, AND NEVADA.

BY C. HART MERRIAM.

Owing to unavoidable delay in the publication of my revision of the Pocket Gophers of the genus *Thomomys*, it is thought best to publish the following new species at once:

**Thomomys nevadensis** sp. nov.

*Type* from Austin, Nevada. No. $\frac{25001}{32413}$, ♂ yg. ad. U. S. Nat. Mus., Biological Survey Coll. Collected Nov. 11, 1890, by Vernon Bailey. Original No. 2097.

*General characters.*—Size large—largest of the genus after *T. bulbivorus*. Two color phases: pale buff and dark plumbeous slate. Skull suggesting that of *T. bulbivorus;* incisors curving far forward, tail of medium length.

*Color.*—*Normal pelage:* upper parts buff, pinkish buff, or buffy gray, becoming darker (sometimes dusky) on nose and around mouth; under parts whitish buffy, the plumbeous under fur showing through; fore and hind feet and tail whitish; ears and small post-auricular spot dusky. *Plumbeous pelage:* uniform slate color above and below, with irregular white patch on throat and inner side of cheek pouches; fore and hind feet and terminal part of tail (irregularly) white or whitish.

*Cranial characters.*—Skull large and heavy, only exceeded by that of *T. bulbivorus*, which it resembles in general characters except in the peculiar form of the pterygoids; zygomata widely spreading; squarely angular, the jugals essentially parallel; temporal ridges meeting in a low sagittal crest in old males; premaxillæ pushing far back behind nasals; pterygoids normal (not expanded and inflated as in *bulbivorus*); incisors projecting forward, but not so far as in *bulbivorus*.

*Measurements.*—Type specimen: total length, 275; tail vertebræ, 90; hind foot, 38.

**Thomomys angularis** sp. nov.

*Type* from Los Baños, Merced Co., California. No. 58123, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Jan. 1, 1894, by J. E. McLellan. Original No. 418.

*General characters.*—Size medium; color grizzled fulvous, varying in intensity; skull similar in general to that of *T. fulvus*, but more massive, and differing in several characters; upper incisors moderately produced.

*Color.*—Upper parts fulvous, grizzled with black tipped hairs, which are most numerous on middle of back; top of nose and ears blackish; under parts plumbeous strongly washed with buffy ochraceous; fore and hind feet and tail whitish.

*Cranial characters.*—Skull large and massive; braincase broad; zygomata widely and squarely spreading; jugals parallel; temporal ridges meeting in old age; nasals emarginate posteriorly; interorbital region rounded; angular process of mandible expanded and produced. The skull of *T. angularis*, contrasted with that of *T. fulvus*, is heavier, with larger and more squarely spreading zygomata, more rounded interorbital part of frontals; approximating temporal ridges; larger pterygoids, much larger angular processes of under jaw, and more prominent incisors.

*Measurements.*—Type specimen: total length, 257; tail vertebræ, 75; hind foot, 32.

**Thomomys mazama** sp. nov.

*Type* from Crater Lake, Mt. Mazama, Oregon. Exact locality, head of Anna Creek; altitude, 6000 feet. No. 80502, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Sept. 3, 1896, by E. A. Preble. Original No. 1485.

*General characters.*—Size rather small; color dull fulvous; similar to *T. monticolus* Allen, but somewhat darker and differing materially in cranial characters.

*Color.*—Upper parts from just in front of eyes to base of tail dull fulvous brown; under parts strongly washed with fulvous; nose, end of muzzle all round; small circle round eye; ear and post-auricular spot dusky; fore and hind feet and tail whitish.

*Cranial characters.*—Skull rather long and slender; similar to that of *T. monticolus* Allen, but audital bullæ decidedly larger; zygomata somewhat more spreading, and sulcus on inner side of upper incisor less marked.

*Measurements.*—Type specimen: total length, 214; tail vertebræ, 71; hind foot, 27.5. Average of 3 specimens from Cratér Lake: total length, 214; tail vertebræ, 71; hind foot, 28.

**Thomomys quadratus** sp. nov.

*Type* from The Dalles, Oregon. No. 57134, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Nov. 2, 1893, by C. P. Streator. Original No. 3359.

*General characters.*—Externally similar to *T. mazama* and *T. nasicus*, but with a totally different skull.

*Color.*—Upper parts from half way between eyes and nose posteriorly to tail, russet fulvous; under parts dark plumbeous, washed with salmon fulvous; nose, muzzle all round, and ear spot dusky; fore and hind feet and tail whitish, irregularly clouded with dusky.

*Cranial characters.*—Skull short and broad; zygomata abruptly and widely spreading, with anterior-external angle nearly square and jugals parallel; nasals rather short, broad, squarely truncate posteriorly, and early ankylosed together; temporal ridges distant, parallel; interparietal rather large and roughly oval; audital bullæ rather large; upper incisors not sloping forward.

*Measurements.*—Type specimen: total length, 220; tail vertebræ, 67; hind foot, 29. Average of 6 specimens from type locality: total length, 205; tail vertebræ, 64; hind foot, 27.

### **Thomomys leucodon** sp. nov.

*Type* from Grant Pass, Rogue River Valley, Oregon. No. $\frac{32034}{43848}$, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Dec. 17, 1891, by C. P. Streator. Original No. 1394.

*General characters.*—Similar to *T. laticeps* from Humboldt Bay, but smaller; under parts brighter fulvous; incisors white instead of yellow and sloping more strongly forward; all the teeth much smaller.

*Color.*—Upper parts from nose to tail dull fulvous brown, becoming brighter on sides and belly; nose, sides of mouth, and ear spots dusky [no dusky ring round eye]; fore and hind feet whitish; tail yellowish buff.

*Cranial and dental characters.*—Braincase broad; zygomata widely spreading; temporal ridges parallel, distant; interparietal rather large, shield shaped; skull similar to that of *T. laticeps* but smaller; nasals narrower and more deeply notched posteriorly; basi-occipital narrower; incisors sloping far forward, their anterior faces white (sometimes slightly stained with pale yellow), narrower and more rounded than in *laticeps*.

*Measurements.*—Type specimen: total length, 221; tail vertebræ, 68; hind foot, 29.

### **Thomomys operarius** sp. nov.

*Type* from Keeler, Owens Lake, Inyo Co., California. No. $\frac{25054}{32466}$, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Nov. 29, 1890, by E. W. Nelson. Original No. 1.

*General characters.*—Size small; color pale buffy; fore claws very long and slender; cranial characters peculiar. Does not require comparison with any known species.

*Color.*—Uniform buffy yellowish or buff gray (according to pelage) from end of nose to tail; post-auricular spots plumbeous; under parts plumbeous strongly washed with white; fore and hind feet and tail white.

*Cranial characters.*—Skull short, broad, and massive, with widely and squarely spreading zygomata, short and broad rostrum, broad interorbital region, and well marked temporal ridges (1–2 mm. apart in adults).

*Measurements.*—Type specimen: total length, 228; tail vertebræ, 67; hind foot, 30. Average of 14 specimens from type locality: total length, 217; tail vertebræ, 67; hind foot, 29.2.

### Thomomys alpinus sp. nov.

*Type* from Mt. Whitney, High Sierra, California. Exact locality, Big Cottonwood Meadows (altitude, 10,000 feet), 8 miles SE. of Mt. Whitney peak. No. $\frac{30528}{42512}$, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected August 6, 1891, by B. H. Dutcher. Original No. 167.

*General characters.*—Size rather small; coloration dark; similar in general to *T. fulvus*, but fulvous tints much duller and paler; skull smaller and less angular.

*Color.*—Type (in pale pelage): upper parts between sepia and drab brown, suffused with very pale dull fulvous brown; nose and sides of mouth dusky, the dusky reaching up between eyes; ears dusky, but without distinct post-auricular spot; under parts plumbeous, strongly washed with ochraceous buff; throat, fore feet, and tail irregularly white; hind feet white. There is a very much darker pelage in which the tips of the hairs are russet brown.

*Cranial characters.*—Skull rather small, rounded; zygomata spreading; frontals broad and flat interorbitally; nasals rather short. The skull of *T. alpinus* differs from that of *T. fulvus* in smaller size, shorter and less angular zygomata, shorter nasals, more smoothly rounded braincase, and less pronounced temporal ridges.

*Measurements.*—Type specimen: total length, 228; tail vertebræ, 67; hind foot, 30. Average of 6 specimens from type locality: total length, 220.5; tail vertebræ, 63; hind foot, 30.2.

### Thomomys nasicus sp. nov.

*Type* from Farewell Bend, Des Chutes River, Oregon. No. 79815, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Aug. 4, 1896, by E. A. Preble. Original No. 1274.

*General characters.*—Similar to *T. mazama*, but slightly paler, and with distinctive cranial characters.

*Color.*—Upper parts from in front of eyes to tail uniform pale russet fulvous; under parts dark plumbeous, strongly washed with pale fulvous; nose and front of muzzle pale dusky; a dark spot around and behind ear; fore and hind feet and tail whitish.

*Cranial characters.*—Skull long and slender, similar to that of *T. mazama*, but rostrum longer; nasals exceedingly elongated; zygomata sloping strongly backward; audital bullæ very small; temporal ridges distant; interparietal large and transversely elongated.

*Measurements.*—Type specimen: total length, 214; tail vertebræ, 69; hind foot, 27.

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PROCEEDINGS

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# *OVIS NELSONI*, A NEW MOUNTAIN SHEEP FROM THE DESERT REGION OF SOUTHERN CALIFORNIA.

BY C. HART MERRIAM.

Mountain sheep were found by the Death Valley Expedition in several of the desert ranges of southern California and southern Nevada, where ten specimens were secured by Mr. E. W. Nelson. They were killed in the northern continuation of the Funeral Mountains, locally known as the 'Grapevine Range.' Compared with the well known Bighorn of the Rocky Mountains and Cascade-Sierra system, they are much paler in color, somewhat smaller in size, and have very much smaller molar teeth. Compared with *Ovis stonei* recently described by Dr. Allen, the contrast in color is even more marked; but the pattern seems to be the same, and the darkening of the under parts and legs is also a character of *stonei*. In the absence of necessary material for comparison it seems best to treat the new form as a full species.

The geographic range of the southern Bighorn is unknown, but it is probable that all of the sheep of the semi-barren desert ranges of Mexico and the southern United States, from Texas to California, belong to the present form.

It is a noteworthy coincidence that Mr. Nelson, who in northern Alaska discovered and named the northernmost American Sheep (*Ovis dalli*), should also secure, in the Sonoran deserts of California, the southernmost representative of the group. In view of these facts, it seems peculiarly appropriate that the new sheep should perpetuate Mr. Nelson's name, which I take pleasure in bestowing upon it.

**Ovis nelsoni** sp. nov.

*Type* from Grapevine Mountains, on boundary between California and Nevada, just south of latitude 37°. No. $\frac{28383}{40487}$, ♀ ad. U. S. Nat. Mus., Biological Survey Coll. Collected June 4, 1891, by E. W. Nelson. Original No. 942.

*General characters.*—Apparently similar to *Ovis stonei* Allen in pattern of coloration, but much paler; rump patch small and completely divided on median line; tail short and slender; molar teeth very small.

*Color.*—Upper parts, except rump patch, pale dingy brown; under parts and legs much darker, contrasting sharply with the white areas; inguinal region, hinder part of belly (narrowing to a point anteriorly some distance behind forelegs), inner aspect of thighs and posterior aspect of fore and hind legs, white.

*Measurements* (taken in flesh by collector).—Total length, 1280; tail vertebræ, 100; hind foot, 360; height at shoulder, 830. In the dry skin the rump patch measures about 190 in breadth by 150 in length (from apparent base of tail).

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PROCEEDINGS

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# DESCRIPTIONS OF TWO NEW PUMAS FROM THE NORTHWESTERN UNITED STATES.

BY C. HART MERRIAM.

**Felis hippolestes** sp. nov.

*Type* from Wind River Mts., Wyoming (near head of Big Wind River). No. 57936, ♂ old. U. S. Nat. Mus., Biological Survey Coll. Collected in November, 1892, by John Burlingham.

*General characters.*—Size enormous; color reddish brown; skull and teeth large and massive; frontal region elevated; upper carnassial with well developed inner cusp.

*Color.*—Upper parts dull pale rufous brown, darkest along middle of back and on tail; tip of tail black; nose to eyes grayish brown; a pale patch over each eye; outer sides of legs and feet pale dull grayish fulvous; back of ears blackish; chin, lips (except dark patch at base of whiskers), throat, breast, under side of fore legs, inguinal region, and hinder part of belly soiled white; under side of tail grayish white.

*Cranial and dental characters.*—Contrasted with skulls of *Felis concolor* from Patagonia and Costa Rica, the skull of *F. hippolestes* differs in very much larger size (basal length 178, instead of 160 or less; zygomatic breadth 160, instead of 135 or less); frontal much more elevated and swollen; postorbital processes broader, shorter, more swollen, and more decurved;* nasals more angular (deflexed) with a pit in frontals over their apex; teeth uniformly larger; upper carnassial with well developed inner cusp; lower premolars much more swollen.

*Measurements* (from well made skin).—Total length, 2600; tail vertebræ, 930; hind foot, 270. *Cranial measurements:* basal length, 178; zygomatic breadth, 160; palatal length (from gnathion), 93; postpalatal length (basion to postpalatal notch), 98; occipito-sphenoid length, 65; breadth across postorbital processes, 84; interorbital breadth, 49.

* In *F. concolor* of corresponding age (rather old) from Pacuare, Costa Rica, the frontals are flat, with relatively long, slender, and only slightly decurved postorbital processes.

**Felis hippolestes olympus** subsp. nov.

*Type* from Lake Cushman, Olympic Mts., Washington. No. 77973 (‘♂’?) ad. U. S. Nat. Mus., Biol. Survey Coll. Collected April 18, 1896, by Thomas Hayes.

*General characters.*—Similar to *F. hippolestes*, but color very much darker; tail concolor to black tip (not grayish white below, as in *hippolestes*); whitish areas on under parts much more restricted and less white.

*Color.*—Upper parts dark rufous brown, darkest along middle of back and on tail; tip of tail blackish; nose to eyes dusky; whole top and sides of head dark except a pale spot over each eye; backs of ears black except posterior edge, which is grayish; lips (except blackish patch at base of whiskers), chin, and anterior part of throat white; neck dull fulvous, palest below; breast and inguinal region soiled whitish; under side of fore legs only lightly washed with whitish; tail dark all round—not grayish white below as in *hippolestes*.

*Remarks.*—The type, though fully adult, is very much smaller and has a much smaller skull than *F. hippolestes*. It is marked ‘♂,’ but possibly this may be an error.

*Measurements* (from well made dry skin).—Total length, 2095; tail vertebræ, 775; hind foot, 260. *Cranial measurements:* basal length, 162; zygomatic breadth, 127; palatal length (from gnathion), 76; postpalatal length (basion to postpalatal notch), 85; occipito-sphenoid length, 60; breadth across postorbital processes, 71; interorbital breadth, 39.

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PROCEEDINGS

OF THE

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# DESCRIPTIONS OF FIVE NEW RODENTS FROM THE COAST REGION OF ALASKA.

BY C. HART MERRIAM.

### Microtus sitkensis sp. nov.

*Type* from Sitka, Alaska. No. 73839, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected August 3, 1895, by C. P. Streator. Original No. 4745.

*General characters.*—Similar in color and general appearance to *M. californicus* in corresponding pelage, but somewhat darker and more reddish brown; belly washed with pale buffy fulvous; ears smaller; tail rather short, upper side black. Cranial and dental characters distinctive.

*Color.*—Upper parts uniform grizzled brown, not conspicuously lined with black hairs, and with a distinct 'reddish brown' suffusion, especially on rump and neck, which is probably peculiar to late summer pelage; under parts plumbeous (without white), the belly washed with ochraceous buff; tail sharply bicolor, black above, white beneath; fore and hind feet and ankles dusky.

*Cranial and dental characters.*—Skull long and narrow, very broad interorbitally; braincase rounded (not angular); interparietal subtriangular and rather small; zygomata not spreading; audital bullæ large and rather elongated (not rounded); incisive foramina very narrow and slit like, falling far short of molars; teeth as in subgenus *Microtus;* first lower molar with 3 closed loops on inner side and 2 on outer side, the anterior loop with no external and only 1 internal salient angle.

*Remarks.*—While externally *Microtus sitkensis* resembles *M. californicus*, its cranial characters place it in a different group, along with the small *M. kadiacensis*.

*Measurements.*—Type specimen: total length, 155; tail vertebræ, 42; hind foot, 23. *Cranial measurements:* basal length, 25; zygomatic breadth, 14; palatal length, 13 [to incisor]; interorbital constriction, 4.2.

### Microtus kadiacensis sp. nov.

*Type* from Kadiak Island, Alaska. No. 65827, ♀ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Sept. 12, 1893, by B. J. Bretherton. Original No. 213.

*General characters.*—Similar to *M. sitkensis* in color and general appearance, but much smaller, somewhat paler, and under parts white instead of ochraceous buff; tail and ears rather short.

*Color.*—Upper parts uniform grizzled pale brownish with pale dull fulvous suffusion, not conspicuously lined with black hairs; under parts plumbeous, strongly washed with pure white; tail sharply bicolor, dusky above, white beneath; fore and hind feet grayish brown.

*Cranial and dental characters.*—Skull similar to that of *M. sitkensis*, but very much smaller; interparietal much more elongated transversely and narrower; audital bullæ very much smaller and narrower; postpalatal pits deeper; teeth essentially as in *sitkensis*, but first lower molar with only 2 completely closed loops on each side.

*Measurements.*—Type specimen, measured in flesh by collector: total length, 141; tail vertebræ, 23 [probably 33]; hind foot, 18 [probably 19 or 20]. *Cranial measurements:* basal length, 23.5; zygomatic breadth, 13.5; palatal length, 12.8; interorbital constriction, 3.8.

### Microtus unalascensis sp. nov.

*Type* from Unalaska, Alaska. No. $\frac{30772}{42672}$, ♀ im. U. S. Nat. Mus., Biological Survey Coll. Collected Aug. 13, 1891, by C. Hart Merriam. Original No. z.

*General characters.*—Similar to *M. kadiacensis*, but apparently somewhat darker; audital bullæ much shorter and more globular; front lower molar with two closed and two open loops on inner side, and two closed and no open loops on outer side.

*Color.*—(Specimen immature): Upper parts yellowish brown, darkest on head; under parts plumbeous washed with whitish; tail sharply bicolor, narrowly black above, broadly white below; fore and hind feet grayish.

*Measurements.*—Type specimen (not full grown): total length, 122; tail vertebræ, 28; hind foot, 19.

*Remarks.*—This species, which resembles *M. ratticeps* of Europe in the enamel pattern of the first lower molar, is closely related to *M. kadiacensis*, from which it may be distinguished at a glance by the much shorter and more globular audital bullæ and the pattern of $\overline{m\,1}$.

During the single night spent at Unalaska on my return from the Seal Islands, I caught several of these Voles along the edges of a small pond on the outskirts of the Aleutian village of Hulinik. Unfortunately, all but one were eaten by Ravens shortly after daylight. The one secured had dragged the trap into the water and drowned out of reach of the Ravens.

**Peromyscus sitkensis** sp. nov.

*Type* from Sitka, Alaska. No. 73809, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected July 30, 1895, by C. P. Streator. Original No. 4720.

*General characters.*—Size very large—much the largest of the species occurring north of Mexico except *P. californicus*, from which it differs in so many characters as to require no comparison; tail long; ears medium or rather small; coloration dark, in summer pelage reddish brown.

*Color.*—Upper parts brown, becoming russet posteriorly on back, rump, and sides; ring round eye (broadest in front of eye) and posterior aspect of ankles, dusky; under parts white, the plumbeous under fur showing through; fore and hind feet whitish; tail sharply bicolor, blackish above, broadly white below; ears dusky, narrowly edged with whitish.

*Cranial characters.*—Skull large; braincase rather flat; rostrum greatly elongated; pterygoid fossæ unusually developed. Contrasted with the skull of *P. californicus*, the only species which equals or exceeds it in size, the braincase is very much smaller and lower and the rostrum very much longer. The total length of the skull is greater than in *californicus*, although *californicus* is much the larger animal.

*Measurements.*—Type specimen: total length, 222; tail vertebræ, 112; hind foot, 26. Average of 20 specimens from type locality: total length, 218; tail vertebræ, 111.6; hind foot, 26.2. *Cranial measurements:* total length, 31; basilar length of Hensel, 24; zygomatic breadth, 15; incisors to postpalatal notch, 13; length of nasals, 13.

*Remarks.*—Apparently *Peromyscus sitkensis* is related to *P. macrorhinus* (Rhoads), from Skeena River, which latter animal I have not seen. It differs from *P. macrorhinus* in uniformly larger size, 'redder' color, and much longer nasal bones.

**Zapus hudsonius alascensis** subsp. nov.

*Type* from Yakutat Bay, Alaska. No. 73584, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected July 5, 1895, by C. P. Streator. Original No. 4660.

*General characters.*—Similar externally to *Zapus hudsonius* from northern Minnesota, but slightly larger; rostrum and zygomata longer; mandible larger; molars heavier; crown of last lower molar longer.

*Color.*—Dorsal area well defined, grizzled dusky and yellowish; sides from nose to base of tail ochraceous, conspicuously lined with black hairs; ankle dusky posteriorly; tail sharply bicolor, grayish brown above, whitish beneath; fore and hind feet soiled whitish.

*Remarks.*—*Zapus alascensis* is much more closely related to *Z. hudsonius* of the northeastern United States and Canada than to *Z. trinotatus* of the Puget Sound region. It agrees with *hudsonius* and differs from *trinotatus* in the narrow braincase, small incisive foramina, and relatively small under jaw. The crown of the last lower molar is longer than in either *hudsonius* or *trinotatus*.

*Measurements.*—Type specimen: total length, 225; tail vertebræ, 139; hind foot, 32. Average of 4 specimens from type locality: total length, 217.5; tail vertebræ, 132; hind foot, 31.5.

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PROCEEDINGS

OF THE

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MARINE BIOLOGICAL LABORATORY WOODS HOLE MASS.

# DESCRIPTION OF A NEW FLYING SQUIRREL FROM FT. KLAMATH, OREGON.

BY C. HART MERRIAM.

**Sciuropterus alpinus klamathensis** subsp. nov.

*Type* from Fort Klamath, Oregon (Transition zone, altitude 4200 feet). No. 87310, ♀ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Jan. 11, 1897, by B. L. Cunningham. Original No. 355.

*General characters.*—Similar to *S. alpinus fuliginosus* Rhoads, but smaller; tail paler above and buffy below (not clouded with dusky). Differs from *fuliginosus* in having the nose and head much paler, cheeks yellowish white instead of bluish gray, and audital bullæ smaller.

*Color.*—Upper parts dark drab brown, sometimes tinged with pale dull fulvous brown; under parts yellowish buff, the plumbeous under fur showing through; tail: upper surface like back, but somewhat darker, especially toward the end; under surface uniform deep buff; nose and face pale; cheeks pale yellowish gray; top of head very pale grayish fulvous; ears decidedly paler than in true *alpinus* or *fuliginosus*.

*Cranial characters.*—Contrasted with *S. alpinus* the skull is narrower posteriorly, particularly the braincase and posterior roots of the zygomata. Compared with *fuliginosus* the audital bulke are decidedly larger and the braincase is less strongly decurved posteriorly.

*Measurements.*—Type specimen: total length, 329; tail vertebræ, 138; hind foot, 38.

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MARINE BIOLOGICAL WOODS HOLE LIBRARY

# DESCRIPTION OF A NEW FLYING SQUIRREL FROM FT. KLAMATH, OREGON.

BY C. HART MERRIAM.

**Sciuropterus alpinus klamathensis** subsp. nov.

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*General characters.*—Similar to *S. alpinus fuliginosus* Rhoads, but smaller; tail paler above and buffy below (not clouded with dusky). Differs from *fuliginosus* in having the nose and head much paler, cheeks yellowish white instead of bluish gray, and audital bullæ smaller.

*Color.*—Upper parts dark drab brown, sometimes tinged with pale dull fulvous brown; under parts yellowish buff, the plumbeous under fur showing through; tail: upper surface like back, but somewhat darker, especially toward the end; under surface uniform deep buff; nose and face pale; cheeks pale yellowish gray; top of head very pale grayish fulvous; ears decidedly paler than in true *alpinus* or *fuliginosus*.

*Cranial characters.*—Contrasted with *S. alpinus* the skull is narrower posteriorly, particularly the braincase and posterior roots of the zygomata. Compared with *fuliginosus* the audital bullæ are decidedly larger and the braincase is less strongly decurved posteriorly.

*Measurements.*—Type specimen: total length, 329; tail vertebræ, 138; hind foot, 38.

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PROCEEDINGS

OF THE

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# DESCRIPTIONS OF FIVE NEW SHREWS FROM MEXICO, GUATEMALA, AND COLOMBIA.

BY C. HART MERRIAM.

### **Blarina thomasi** sp. nov.

*Type* from Plains of Bogota, Colombia (on G. O. Child's estate near City of Bogota, alt. about 9000 feet). Collected Nov. 14, 1895. Type in British Museum.

*General characters.*—Size large; coloration sooty-plumbeous. Similar to *B. fossor*, but fore feet very much smaller and molariform teeth not excavated posteriorily.

*Color.*—Sooty plumbeous, darkest on the back.

*Cranial and dental characters.*—Skull and palate almost exactly as in *B. fossor*, but molariform teeth solid (not excavated posteriorly) and unicuspidate teeth with inner cusp behind instead of in front (on postero-internal instead of antero-internal angle).

*Remarks.*—For the opportunity to describe this very interesting shrew I am indebted to Mr. Oldfield Thomas, Curator of Mammals in the British Museum, who sent me seven specimens from the type locality. Heretofore the genus *Blarina* has not been recorded from any point south of Costa Rica; hence the discovery of the present species in South America is of unusual interest.

*Measurements* (from dry skin).—Total length, 110; tail vertebræ, 28; hind foot, 14.5; skull, 21 x 10.

### **Notiosorex gigas** sp. nov.

*Type* from Mts. at Milpillas, near San Sebastian, Jalisco, Mexico. No. 88012, ♀ ad. U. S. Nat. Mus., Biological Survey Coll. Collected March 15, 1897, by E. W. Nelson and E. A. Goldman. Original No. 10706.

*General characters.*—Similar to *Notiosorex crawfordi*, but very much larger; tail relatively as well as actually longer.

*Color.*—Uniform slate gray, slightly darker on rump and slightly paler

on under parts; belly with a faint brownish tinge; tail concolor with upper and lower surfaces of body.

*Cranial and dental characters.*—Skull large and massive, widely different from *N. crawfordi* and *erotis;* braincase highly arched, as in *Blarina mexicana*, which it greatly resembles (see figure of skull of *B. mexicana*, N. Am. Fauna, No. 10, pl. 1, fig. 11, Dec. 1895): constriction swollen; walls of anterior nares thickened; teeth white throughout, without trace of color on tips; molars swollen and crowded, not excavated posteriorly.

*Remarks.*—Mr. Nelson caught 3 specimens of this fine shrew near the creek, just below the mouth of the canyon, at Milpillas. He says they were living under shelter of logs, rocks, and banks in damp places grown up to bushes and weeds away from the woods.

*Measurements* (from dry skin*).—Total length, 128; tail vertebræ, 45; hind foot, 15. *Cranial measurements:* total length of skull, including incisors, 23; greatest breadth, 10.5.

### Sorex sclateri† sp. nov.

*Type* from Tumbala, Chiapas, Mexico (alt., 5000 ft.). No. 75872, ♀ ad. U. S. Nat. Mus., Department of Agriculture Coll. Collected Oct. 23, 1895, by E. W. Nelson and E. A. Goldman. Original No. 8567.

*General characters.*—Size large; tail long; hind foot very long (16 mm.); color similar to *S. macrodon*, but ears smaller, and skull very different.

*Color.*—Upper parts dusky, finely mixed with sepia brown, darkest over the rump; under parts seal brown; tail dusky; paler below, without line of demarkation; feet dusky.

*Cranial and dental characters.*—Skull large, long, and rather slender (20 x 9 mm.); rostrum, palate, and dentition (in general) much as in *S. saussurei caudatus*, but postpalatal region and braincase decidedly longer; interpterygoid fossa broad and long; first and second unicuspids subequal or second slightly the larger; third unicuspid, as seen from the side, decidedly larger than fourth; as seen from below, subequal or slightly smaller; teeth very white, the red tips greatly reduced.

*Remarks.*—*Sorex sclateri* is a very peculiar species, and does not seem to be at all closely related to any of the other shrews known from Mexico or Central America. The large size of the hind foot and peculiar elongation of the postpalatal part of the skull suffice to distinguish it from the species that approach it in size, while the relatively large size of the third unicuspidate tooth is distinctive. Singularly enough, in general form of skull and relative proportions of unicuspids *Sorex sclateri* resembles *S. orcopolus*, a small short-tailed species inhabiting the Sierra Nevada de Colima of Jalisco.

*Measurements.*—Type specimen: total length, 126; tail vertebræ, 52; hind foot, 16. Average of 5 specimens from type locality: total length, 125; tail vertebræ, 53; hind foot, 16.

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* Field measurements not yet received from collector.

† Named in honor of Dr. Philip Lutley Sclater, the distinguished Secretary of the Zoölogical Society of London.

### Sorex salvini * sp. nov.

*Type* from Calel, Totonicapan, Guatemala (alt., 10200 ft. = 3100 meters). No. 77035, ♀ ad. U. S. Nat. Mus., Department of Agriculture Coll. Collected Jan. 12, 1896, by E. W. Nelson and E. A. Goldman. Original No. 9057.

*General characters.*—Size small (about equalling *S. ventralis*); ears medium or rather large; tail rather short; *belly very dark*, thus differing from all the other known small species from either Mexico or Guatemala.

*Color.*—Upper parts rich dark sepia brown, darkest over the rump; under parts seal brown; tail faintly bicolor.

*Cranial and dental characters.*—Skull similar to that of *ventralis*, but somewhat larger (18.5 mm.); constriction of rostrum more swollen. First and second unicuspids subequal; third slightly larger than fourth as seen from the side, but really smaller as seen from below. Molariform teeth moderately excavated; larger than those of *ventralis*.

*Remarks.*—This small shrew seems to be more nearly related to *ventralis* than to any other. It is very much darker than *ventralis*, both above and below, has a slightly longer tail, larger skull, and larger molariform teeth.

*Measurements.*—Type specimen: total length, 104; tail vertebræ, 41; hind foot, 13.5. Average of two specimens from type locality: total length, 106; tail vertebræ, 42; hind foot, 13.75.

### Sorex godmani * sp. nov.

*Type* from Volcano Santa Maria, Quezaltenango, Guatemala (alt., 9000 ft. = 2740 meters). No. 77044, ♀ ad. U. S. Nat. Mus., Department of Agriculture Coll. Collected Jan. 28, 1896, by E. W. Nelson and E. A. Goldman. Original No. 9239.

*General characters.*—Size rather large (hind foot nearly 15 mm.); tail long; ears conspicuous; similar to *S. caudatus*, but color less dark and skull decidedly smaller.

*Color.*—Upper parts uniform dark sepia brown with a faint chestnut tinge; under parts seal brown; tail dark all round.

*Cranial and dental characters.*—Skull of normal shape (braincase somewhat flattened in type specimen), rather small for size of animal; first and second unicuspids subequal, third slightly smaller than fourth; molariform teeth rather deeply excavated posteriorly. Skull similar in general to that of *caudatus* but much smaller (18 x 8 mm. instead of 19.5 x 9.5); molariform teeth much smaller and more deeply excavated posteriorly.

*Remarks.*—*Sorex godmani* agrees with *S. stizodon* in color, but is larger, has a much longer tail (55 mm. instead of 41) and very different skull and

* These two species are named in honor of Osbert Salvin and F. Du Cane Godman, the distinguished editors of the Biologia Centrali-Americana. Their names must ever be associated with the natural history of Guatemala.

teeth (skull more slender and delicate; pm and m $^{1}$ and m $^{2}$ much more deeply excavated posteriorly; second unicuspid *not* larger than first). Its nearest relative seems to be *S. saussurei caudatus*, which differs from it in somewhat darker coloration, in having the tail decidedly paler below, and in the cranial and dental peculiarities already described.

*Measurements.*—Type specimen: total length, 120; tail vertebræ, 57; hind foot, 15. Average of 4 specimens: total length, 122.5; tail vertebræ, 55; hind foot, 14.7.

*Specimens examined.*—Total number, 4, from the following localities in Guatemala:

Volcano Santa Maria, Quezaltenango (type locality), 3.
Todos Santos, Huehuetenango, 1.

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PROCEEDINGS

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# DIAGNOSES OF NEW SPECIES OF FISHES FOUND IN BERING SEA.

BY THEO. GILL AND CHAS. H. TOWNSEND.

In 1895 the junior author served as naturalist on the U. S. Fish Commission steamer *Albatross* and obtained many fishes at various depths. Among them were 14 species apparently hitherto undescribed. Diagnoses of these are here given by permission of Captain John J. Brice, U. S. Commissioner of Fish and Fisheries, and will hereafter be described at length and illustrated.

## RAIIDÆ.

### Raia rosispinis.

Snout moderately produced, with a soft, moderately narrow rostral cartilage and a blunt tip. Interorbital space nearly plane. Snout with a number of plates having stellate bases about middle, and many smaller asperities, leaving only the borders of the pectorals and ventrals naked. Larger spines with stellate bases are interspersed between the disk and the pectoral rays. A row of about 26 thorn-like spines, with radiating ridges, extends from the interhumeral area to the dorsal fins; two spines on each shoulder. One spine above antocular region, another above postocular region, and another behind it about half the distance.

### Raia obtusa.

Snout not at all produced, but very bluntly rounded. Interorbital space narrow. Mouth small, rectilinear. Minute distant prickles on the snout, the anterior portion of disk and interorbital area, as well as in a broad median band extending on tail to dorsal and commencing at the interhumeral area; a row of scarcely enlarged acute spines above the eye; an uninterrupted row of unguiform spines with smoth bases extending from the interhumeral area to dorsal fin; two similar spines arm each shoulder.

**Raia interrupta.**

Snout moderately produced, with a soft very attenuated rostral cartilage and a blunt tip. Interorbital space concave. Mouth small; the width equal to half preoral area. Entire back covered with very small embedded spines, extending nearly uniformly over the disk and snout, leaving only the tip of the latter naked; a row of compressed acutely curved, smooth spines along middle of back, extending from the interhumeral region to dorsal, but interrupted along the posterior half of disk, where the spines are absent or obsolete; about four spines are in the anterior portion and the series recommences on a line with the emargination of the disk; a single spine on each shoulder and occasionally a rudimentary second; no specialized supra-orbital spines.

NOTACANTHIDÆ.

**Macdonaldia alta.**

D., 32; A. (31 to end of dorsal) 52 spines, 125 rays.

Body comparatively high; greatest height equal to $3\frac{2}{3}$ the distance between vent and tip of snout. Pectoral fin with its root twice as far from upper cleft of branchial aperture as from the lateral line, and much nearer to the posterior end of operculum than to lateral line.

Bering Sea, Lat. N. 54° 54′, Long. W. 168° 59′ (station 3604, Aug. 13, 1895; 1401 fathoms).

**Macdonaldia longa.**

D., 33; A. (26 to opposite end of dorsal) 55 spines, 111 rays.

Body comparatively slender, with the greatest height about one-fifth distance between vent and tip of snout. Pectoral fin with its root three times as far from upper cleft of branchial aperture as from lateral line, and very much nearer lateral line than end of operculum.

Bering Sea (station 3607, 1895; 900 fathoms).

ALEPOCEPHALIDÆ.

**Ericara**, new genus.

Alepocephalids with small, perfectly smooth, imbricated cycloid scales, wide cranium, projecting snout, deeply cleft mouth, uniserial and acrodont teeth on vomer and anterior portion of palatines, and dorsal and anal of normal extent and opposite each other.

**Ericara salmonea.**

Dorsal, 17; anal, 24. Maxillary extending to vertical of posterior border of orbit. Head large: length, $8\frac{1}{2}$; depth, 5; width, $4\frac{1}{2}$.

Bering Sea, S.W. of Pribilof Islands (station 3603, 1895; 1771 fathoms).

LYCODIDÆ.

**Lycodes digitatus.**

Body moderately elongate, its greatest height being between $\frac{1}{8}$ and $\frac{1}{9}$ of the total length; covered with small, entirely separated embedded scales,

which become nearer anteriorily and extend in advance of the dorsal fin as well as on the vertical fins. No specialized area of smaller scales behind base of pectorals. Pectorals scaleless. Head moderate, $\frac{1}{5}$ in length, entirely naked.

Color (in alcohol) brownish yellow suffused with reddish in front, variegated, darker anteriorily, with four dark longitudinal bands most distinct about middle of body, fading out backwards. Fins light and without dark margins. Head dark above and laterally, light below. Dorsal, 101; ventral, 81; pectoral, 18.

Bering Sea, Lat. N. 56° 14′, Long. W. 164° 8′ (station 3541; 49 fathoms).

### Lycodes concolor.

Body rather elongated, its greatest height being less than $\frac{1}{7}$ total length; covered with very small, entirely separated embedded scales which become more distant anteriorly and extend in advance of the dorsal fin and scapular region, as well as on the vertical fins; pectorals with scattered scales on external and internal surfaces near base. A specialized area of smaller scales behind base of pectoral and a naked area around upper axilla of pectorals. Head moderate, a fifth of total length, entirely naked. Color nearly uniform, only relieved by the apparently lighter hue of the scales and the somewhat darker margins of the fins. Dorsal, 118; ventral, 98; pectoral, 21.

Bering Sea, Lat. N. 55° 19′, Long. W. 168° 11′ (station 3608, Aug. 12, 1895; 276 fathoms).

## MACRURIDÆ.

### Macrurus lepturus.

Type 22 inches long. D., 14–122. A., 116. P., 20. V., 8.

Scales deciduous and moderate, oblong or oval with reduced exposed surfaces; those on the back or above the lateral line have a few (3–5) ridges beset with spines, but those below are mostly unarmed. Head one-sixth of entire length, regularly conical. Snout moderately extended. Median tubercle very projecting; lateral well developed, connected by well defined ridge; infraorbital vertical, with the ridge linear and near the orbit. Teeth cardiform in both jaws; the lower teeth beset the outer slope of the jaw.

Bering Sea, S. W. of Pribilof Islands (station 3604; 1401 fathoms).

### Macrurus dorsalis.

Type length, 26 inches. D., 15–120. A., 122. P., 21. V., 9.

Scales deciduous and rather small, diversiform, with small exposed surfaces; near the dorsal they have about five radiating spinigerous ridges, but below the lateral line these ridges are fewer and unarmed. Head a little more than one-sixth of the length. Snout short, projecting a considerable length beyond the eye and a little beyond the supramaxillary. Median tubercle very prominent; connecting ridge is well defined; infraorbital nearly vertical, with the ridge linear and near the orbit. Teeth cardiform.

Bering Sea, S. W. of Pribilof Islands (station 3604; 1401 fathoms).

**Macrurus firmisquamis.**

Type 31 inches long. D., 12–126. A., 105. P., 20. V., 8.

Scales firmly affixed, oblong or rather short, and with considerable exposed surfaces, which have subequal radiating ridges beset with numerous acute spinelets; the ridges vary from 3 to 8 in number. Head regularly convex in profile, a fifth of the entire length. Snout longer than the diameter of the eye. Rostral tubercles obsolete and infraorbital ridge rounded. Teeth biserial or triserial. This species is distinguishable from all its American congeners, at least, by the very firm scales.

Bering Sea, S. W. of Pribilof Islands, 1895.

**Macrurus (Nematonurus) magnus.**

Type 43 inches long. D., 9–128. A., 121. P., 15. V., 6.

Scales moderately large, readily deciduous, decidedly oblong or long, with a small exposed surface which is beset with five to seven radiating unarmed ridges. Head regularly conical, less than one-fifth of the length. Snout rather long; projects half its length beyond the mandible. Tubercles feebly developed, plain and continuous from 3 parallel ridges; infraorbital flat, with the crest rather nearer the orbit than its lower margin; its entire surface scaly. Teeth in the upper row biserial or triserial; in lower jaw imperfectly biserial or uniserial.

Bering Sea, S. W. of Pribilof Islands.

**Macrurus (Nematonurus) suborbitalis.**

Type 20 inches long. D., 12–85. A., 102. P., 19. V., 11.

Scales closely adherent and rather large, mostly short and roundish, with considerable exposed surfaces, having radiating ridges beset with weak spines. Head a little more than one-sixth of the entire length. Snout projects little. Median and lateral tubercles are faintly developed; infraorbital narrow, divided into two well marked areas—an upper wider, distinguished by the glassy tubercular scales, and the narrow lower, almost skinny and scaleless; the ridge independently, is little marked. Teeth biserial in the upper jaw, robust in the outer row, very weak in the inner; uniserial in lower jaw and scarcely incurved.

Bering Sea, S. W. of Pribilof Islands (station 3603; 1771 fathoms).

PLEURONECTIDÆ.

**Hippoglossoides robustus.**

Body rather high, its greatest height nearly equaling half the length from the snout to base of caudal. Profile decurved above the eye. Body thick. Scales on head separate and rarely touch each other. Lateral line more arched than in allied species. Teeth of the single row mostly separated from each other by intervals equal to width of teeth, curved inward, and uniform on the sides; toward front four or five enlarged teeth, preceded by two smaller, leaving the middle toothless. In the lower jaw of nearly uniform size and inclining backwards.

Bering Sea, Lat. N. 56° 14′, Long. W. 164° 8′ (station 3541; 49 fathoms).

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

MARINE BIOLOGICAL LABORATORY LIBRARY WOODS HOLE, MASS.

# ON A SMALL COLLECTION OF MAMMALS FROM HAMILTON INLET, LABRADOR.

BY OUTRAM BANGS.

In the early summer of 1895 Mr. C. H. Goldthwaite started for Hamilton Inlet, Labrador, to collect mammals for the Bangs' Collection. Upon reaching St. Johns, Newfoundland, he was met by the discouraging news that on account of the troubles of the government and the low state of its finances, there was some doubt as to whether its steamer would make the usual annual trip up the Labrador coast for the purpose of carrying supplies and picking up shipwrecked fishermen and explorers. Most of the fishing vessels that visit Labrador in summer had already sailed, but after much delay and trouble he secured passage from Conception Bay in a belated fisherman, and finally arrived at Hamilton Inlet, after a long and tedious voyage.

Here he collected from July 5 to September 9, in the immediate vicinity of the Hudson Bay post of Rigoulette, about eighty miles up Hamilton Inlet, or Grosswater Bay, as it is usually called by the inhabitants. I had hoped that his work would cover a larger area, and that he might get far enough from the post to collect fur-bearing and other large animals, but this proved impossible. The only way to make such a trip successfully would be to go prepared to remain throughout the winter. In summer the inhabitants are all busy with salmon fishing, their principal means of subsistence, and cannot be induced to go inland, even if this were practicable. The heavy growth of moss, saturated with moisture, into which a man sinks above the knee at every step,

makes traveling so laborious as to be nearly impossible, while the constant annoyance from the attacks of blood-sucking flies of four or five kinds becomes almost intolerable. In winter traveling on snow-shoes or on dog sledges is very easy. Then all the men go inland to their various trapping grounds and stay through the season, and if a collector went along with them he could undoubtedly reap a rich harvest. The country about Rigoulette is heavily wooded with a rather stunted growth of spruce and fir, but so near timber line is it that the tops of the hills are devoid of trees. In some places there were large fields of snow that remained unmelted throughout the entire summer. The country is monotonous and offers little diversity for trapping, and with the exception of the lemmings (*Dicrostonyx*), which inhabit only the treeless tops of the hills, all the smaller mammals live under about the same conditions.

In collecting small mammals anywhere one is sure to find some pest to interfere with trapping by eating specimens or bait, or both, and Hamilton Inlet was no exception to the rule. Mr. Goldthwaite's two principal enemies were the Labrador jay and the Esquimaux dog. The jays soon discovered what he was doing, and would follow him in a loose flock, sitting about and watching while he set a trap, and would then descend upon it and steal the bait the moment his back was turned. Often one of them fell a victim to the wicked little Schuyler trap, but this never deterred the others, and no matter how many were killed, there were always as many more following him. The dogs were even worse, for turned out in the summer to forage for themselves, they hunt over the country in packs for miles in every direction. They feed largely on mice, lemmings, and all small mammals, and were very quick to find one caught in a trap. Several of the dogs also got into baited steel traps, and as they are highly prized, especially the leaders. Mr. Goldthwaite was requested by the owners to refrain from setting steel traps at that season of the year.

Mr. Goldthwaite collected the following mammals:

**Lepus americanus americanus** Erxl.

Abundant everywhere. A fine series of 14 young and adult examples has led me to take up a careful study of a large number of specimens of the American hare from many points in eastern North America, the results of which will be published in a separate paper.

The type of *Lepus americanus*, as is well known, came from the south side of Hudson Strait. Hamilton Inlet is not only much south of this, but appears to have quite a different fauna, the small mammals especially being different from those taken at Fort Chimo by L. M. Turner. It is therefore probable that typical *Lepus americanus* is even more extreme than the Hamilton Inlet series, which is at present the best working material available.*

**Zapus hudsonius** (Zimmerman).

Three specimens were caught in the damp mossy spruce woods.

**Fiber zibethicus** (Linn.)

Muskrats were very scarce about Hamilton Inlet, but were said to be abundant in the lakes and rivers of the interior. The one specimen collected, an adult, agrees in every way with true *zibethicus* of northeastern North America generally, and shows no approach to the insular form (*Fiber obscurus*) found in Newfoundland.

**Dicrostonyx hudsonius** (Pallas).

Three specimens of the Hudsonian lemming were secured, all taken at the entrance to one hole on top of a treeless hill. A fourth was also trapped at the same hole, but afterwards destroyed. The lemming was well known to the natives, who called it 'hill mouse,' and said it was usually abundant on all the hills. Mr. Goldthwaite worked very hard to get more, but the dogs had visited all suitable places and dug out the lemmings before he arrived, and the hole where he caught his specimens was the only one he could find that was occupied.

Mr. Gerrit S. Miller, Jr., who examined these specimens at the time he wrote his 'Genera and Subgenera of Voles and Lemmings,' tells me that this lemming is not like any of the old-world species. The name *Mus hudsonius* Pallas† apparently applies to this species, which may be briefly described as follows:

*Color.*—Upper parts gray (about the color of a Maltese cat), somewhat mixed with black tipped hairs and slightly touched in places with rusty; a narrow black stripe along middle of back; long hairs covering ear, mixed black and rusty; a spot of pale yellowish rust color at base of whiskers. Lower sides and under parts dull brownish gray, irregularly washed with rusty, the rust color predominating in front of arms, across

* The Arctic Hare is said to occur at Hamilton Inlet, but Mr. Goldthwaite was unable to get one. It was reported to be more abundant in winter than in summer.

† Richardson (Fauna Boreali-Americana, 1829, p. 132) refers the specific name *hudsonius* to Forster. I cannot find that Forster ever gave his animal (a mutilated specimen) a scientific name, merely styling it 'a small animal called a Field Mouse. Churchill River.'

chest, and about vent. Feet, hands, and tail dull gray, hairy. Tail with a long pencil nearly equaling length of tail.

*Measurements.*—The three specimens measured as follows:

| No. | Sex. | Total length. | Tail vertebræ. | Hind foot. |
|---|---|---|---|---|
| 4166 | ♂ old. | 150 | 21 | 20 |
| 4167 | ♂ yg. ad. | 145 | 22 | 22 |
| 4168 | ♂ yg. | 128 | 16 | 20 |

*Skull.*—The skull of 4166, ♂ old adult, measures: basal length, 28.6; zygomatic breadth, 19.8; mastoid breadth, 14.2; alveolar length of upper molar series, 7.6; incisive foramen, 5.6. That of an adult male *D. torquatus* from Petschora, Russia (No. 3621, collection of Gerrit S. Miller, Jr.), measures: basal length, 27.4; zygomatic breadth, 19; mastoid breadth, 14; alveolar length of upper molar series, 7.4; incisive foramen, 6.8.

These specimens are of approximably equal age, so that they furnish a very satisfactory basis for comparison. The skull of *D. torquatus*, though actually slightly smaller, gives the impression of greater strength and massiveness. This is chiefly due to its broader, less deflected rostrum and slightly shorter, broader brain case. While the width of rostrum is less and the deflection of dorsal outline greater in *D. hudsonius*, the rostral depth at the root of the zygoma is slightly greater in *D. torquatus*. Audital bullæ in *D. hudsonius* distinctly larger and less globular than in *D. torquatus*.

*Teeth.*—As has recently been pointed out,* there is a minute supplemental anterior internal loop in the posterior lower molar of *Dicrostonyx hudsonius* which is apparently absent in the Old World species. Otherwise the dentition calls for no special comment.

### Synaptomys (Mictomys) innuitus (True).

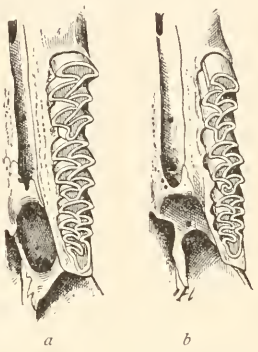
Only one specimen was collected. Dr. C. Hart Merriam and Mr. Gerrit S. Miller, Jr., have kindly compared this specimen with the type of *innuitus* from Fort Chimo, Labrador, with the following results: The Hamilton Inlet specimen is younger than the type of *innuitus*, but is larger, the hind foot measuring 3 mm. more and the skull being actually larger; the tail is also longer. It is a pity that only one specimen from each locality is in existence, as more material from Labrador would probably show that two well marked forms occur there, as is the case with *Evotomys* and probably with *Phenacomys ungava* also. The measurements of the specimen, No. 3972, ♂ young adult, are: total length, 114; tail vertebræ, 25; hind foot, 21.

* Miller, North American Fauna, No. 12, p. 39, foot-note, July 23, 1896.

### Microtus enixus Bangs.*

Next to *Evotomys*, this species was the commonest small mammal about Hamilton Inlet. It was found living everywhere, but was especially abundant along the banks of the brooks where a few reeds and grasses grew; 80 specimens were obtained.

It is very distinct from all other eastern voles, and is at once distinguished by its peculiarly small, weak, molar teeth. (See figure 13.)



*a* *b*

FIG. 13.—*a*. Left upper molar series of *Microtus pennsylvanicus* (Topotype No. 2336, Bangs coll.)

*b*. Left upper molar series of *Microtus enixus* (Topotype No. 3976, Bangs coll.)

### Evotomys proteus Bangs.†

The *Evotomys* was the commonest small mammal, and was found everywhere. No less than 99 specimens were collected. Several times while walking through the forest Mr. Goldthwaite discovered one sitting upon a spruce branch 'like a squirrel.' I have never known of this arboreal habit being noticed in other species. The range of individual color variation in *Evotomys proteus* is simply astounding, and it seems incredible that extremes from the series can belong to the *same* species, yet any specimen picked out can be graded by the most delicate steps into any of the other extremes. The accompanying plate shows admirably a few of the most pronounced color phases.

The Hamilton Inlet and Fort Chimo red-backed mice are very different, representing opposite extremes in the genus. The latter, lately described by Vernon Bailey as *Evotomys ungava*,‡ is a small form with small hind foot, short tail, and little ears concealed by the fur. *E. proteus* is a very large form, with heavy skull, big feet and tail, and large ears.

### Phenacomys ungava Merriam.

The 16 individuals of this interesting species that were caught were all found in one small area on the bank of a little brook, associated with *Microtus enixus* and *Evotomys proteus*. None were taken anywhere else. Mr. Miller had this series when he wrote his 'Synopsis of the Voles of the Genus Phenacomys,' and found that the form is much larger than true *P. ungava*. It is very possible that more specimens from Fort Chimo would show the Hamilton Inlet form to be worthy of separation.

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* Preliminary Description of a New Vole from Labrador, American Naturalist, XXX, Dec. 5, 1896, p. 1051.

† In Vernon Bailey's Revision of the American Voles of the Genus *Evotomys*, Proc. Biol. Soc. of Washington, XI, May 13, 1897, p. 137.

‡ Loc. cit., p. 130.

**Sciurus hudsonicus hudsonicus** Erxl.

Red squirrels were not at all common, four being all that Mr. Goldthwaite was able to get, though constantly on the lookout for them.

**Sorex personatus** I. Geoffroy St. Hilaire.

This species is represented by one skull, kindly identified as *S. personatus* by M[illegible]errit S. Miller, Jr.

It is strange that in all the trapping he did near Hamilton Inlet Mr. Goldthwaite caught but one shrew and no moles.*

**Putorius cicognani cicognani** (Bonaparte).

Mr. Goldthwaite's collection contained 2 specimens ♂ and ♀, which, though taken at a locality so strictly Hudsonian in character, are perfectly referable to the Canadian form, true *cicognani*. This would seem to indicate that typical *Putorius cicognani* pushes farther north in the east than it does in the central part of the continent. The two specimens collected measure as follows: No. 3951, ♂ adult: total length, 300; tail vertebræ, 90; hind foot, 43. No. 3952, ♀ young adult: total length, 256; tail vertebræ, 66; hind foot, 31.

Possibly another form may be found farther inland, as the spruce and fir forest only extends in a narrow belt along the coast, the whole interior being open 'barren grounds,' where the conditions of life must be different from those near the coast.

## EXPLANATION OF PLATE IV.

A series of topotypes of *Erotomys proteus*, in collection of E. A. and O. Bangs, showing some of the color phases to which the species is subject. (All specimens are from Hamilton Inlet, Labrador.)

Fig. 1, No. 4054; Fig. 2, No. 4053; Fig. 3, No. 4068; Fig. 4, No. 4088; Fig. 5, No. 4085; Fig. 6, No. 4118; Fig. 7, No. 4139.

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* One morning Mr. Goldthwaite saw several dogs nosing about a star-nosed mole (*Condylura cristata*) which they had caught but did not relish. One of them, however, instantly swallowed it when he tried to rescue it. He was unable to find any signs of this mole anywhere and secured no specimens.

EVOTOMYS PROTEUS, Bangs, SHOWING VARIATIONS IN COLOR.

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# A LIST OF THE GENERIC AND FAMILY NAMES OF RODENTS.

BY T. S. PALMER.

Generic names of mammals have undergone many changes in recent years, and in no group is this more apparent than in the Rodentia. Not only have new names been proposed for a host of new forms, but many well-known genera now appear under names long forgotten, but revived in obedience to the law of priority. Linnæus, in 1758, recognized only six genera of rodents (including *Rhinoceros!*); Agassiz, in 1842–'46, recorded about 220 generic names in this order, and Marschall, in 1873, added 65 more, making a total of somewhat less than 300. The present list contains more than 600 (a large proportion of which are, of course, synonyms), comprising perhaps 15 percent of the entire number of generic and subgeneric names ever proposed for mammals.

Recent changes in the nomenclature of the Rodentia are well exemplified in two important papers which have appeared during the past few months—one, by Mr. Oldfield Thomas, entitled 'On the Genera of Rodents';[1] the other, by Dr. E. L. Trouessart, comprising part of the second edition of his 'Catalogus Mammalium.' The former paper gives merely a list of the groups of living rodents which the author considers worthy of generic rank, together with references to the original description of each genus. Trouessart's Catalogue, more ambitious in its scope, is

[1] Proc. Zool. Soc. London, 1896, pp. 1012–1028.

intended to include all the species, living and extinct, now recognized. Even with these aids the student will often find difficulty in looking up synonymy or determining the earliest name of a genus, for Thomas gives only about one-third of the names, while Trouessart does not pretend to include all the generic synonyms and frequently omits references.

The present paper differs from either of those just mentioned. It is neither an index nor a catalogue of recognized genera, but merely an attempt to bring together *all* the names, generic and subgeneric, ever proposed. It is not complete in itself, inasmuch as it gives neither references to descriptions nor localities; but the authority, date of publication, and type or included species under each name will throw some light on these points. In arranging this list everything has been subordinated to convenience of reference. Genera and subgenera have been treated alike and distributed under families, while the alphabetical arrangement has been followed both in the sequence of higher groups and in the names under each family. Some difficulty has been experienced in properly grouping the genera, and about a dozen names have not been referred to any family for lack of sufficient information regarding their status. Thomas' classification of recent genera has been followed, except in the case of *Lophiomyidæ*, which is given full family rank, instead of being placed as a subfamily under *Muridæ*. To these 22 groups have been added 5 additional families of extinct rodents recognized by Zittel,[1] making a total of 27 families. More than 200 names occur under *Muridæ*, and for simplicity they have been placed under subfamilies, but this is the only instance in which the alphabetical arrangement of the family has not been followed.[2]

The date is always the year of *actual publication*, often very different from the date of apparent publication. For example, the description of *Schizodon* was published in the Proceedings of the Zoological Society of London for 1841, but it did not actually appear until March, 1842. *Arctomys* was described in a part of the fourth volume of Schreber's Säugthiere, issued in 1782, but the name was first published on plates accompanying this work, which are known to have been distributed in 1780. *Schizodon*

[1] 'Handbuch der Paleontologie,' IV, 1892–'93.

[2] I am indebted to Mr. Thomas for looking over the genera of *Muridæ* and *Octodontidæ* and for several suggestions as to the arrangement of the list.

is therefore quoted as 1842 and *Arctomys* as 1780.[1] Preoccupied names have been marked, and cross-references made to those proposed to replace them. A few names have become almost unrecognizable by reason of the changes they have undergone in the process of emendation. Among such may be mentioned the correction of *Aplodontia* to *Haploodus*, *Pithecheir* to *Pithecochirus*, and *Cœlogenus* to *Genyscœlus*.[2] The original spelling is always given, but no attempt has been made to include all variations, although the more important have been noted. If the first letter of a word has been changed, both forms have been inserted in the list, but other changes have been indicated in foot-notes.

Each genus is followed by the type or species on which it was based. When no type was designated and none has been indicated by a subsequent reviser, all the species are mentioned in the order given in the original description. No doubt some errors will be detected here, for at first an attempt was made to determine the types for as many genera as possible. This plan was subsequently abandoned in favor of an enumeration of all the species originally mentioned, but some cases of elimination may have escaped correction.

More or less lack of uniformity exists in the nomenclature of certain families, as, for example, in the cases of the American Porcupines and Chinchillas. Thomas, considering the New World Porcupines worthy of separation, erected the family *Erethizontidæ*, and Trouessart, a few months later, recognized the same group, but renamed it *Coendidæ*. No less than three family designations for the Chinchillas are in common use—*Chinchillidæ*, *Eriomyidæ*, and *Lagostomyidæ*. Such a condition of things is obviously unnecessary, and can only lead to confusion. As

[1] While this paper was in press, my attention was called to Sherborn's announcement of the discovery of Lacépède's well-known 'Tableau Méthodique' (usually quoted 1801), in the Didot edition of Buffon's Histoire Naturelle, Quad., vol. XIV, 1799 (Nat. Sci., XI, p. 432, Dec., 1897). Lacépède's genera *Agouti*, *Arvicola*, *Coendou*, *Hamster*, *Pika*, and *Talpoides* therefore date from 1799, instead of 1801, but the necessary corrections could only be inserted in the cases of *Pika* and *Talpoides*.

[2] In explanation of this remarkable emendation the author says: "Le *υ* grec ne répondant pas à l'u latin, le nom de Cuvier [*Cœlogenus*] n'est pas acceptable, puisqu, il renferme une faute d'orthographie; et, pour faire un nom d'apparence réellement latine, il aurait au moins fallu écrire *Genyscœlus* et non *Cœlogenus*." Liais, Climats du Bresil, 1872, p. 537.

an aid in selecting the proper name in such cases and to help in determining questions of priority, it has seemed best to give under each group all the family and subfamily names based on genera belonging to it. Full references have also been inserted, inasmuch as authors seldom indicate the place where such names were first published. Groups first described as full families and afterwards reduced to subfamilies have merely a reference to the original description, but those first introduced as subfamilies and afterwards raised to family rank have references to both places of publication. This part of the list has been limited strictly to names ending in '*idæ*' or '*inæ*,' the only exception being old designations with the closely related termination '*ina*.' Here, as elsewhere, the object has been merely to bring together under each family all the available names, without attempting to discriminate between synonyms and names which have a claim to recognition.[1]

This list is supplementary to a complete alphabetical index of the genera of mammals, containing full references to descriptions and localities, which is now almost ready for the press. The data relating to the Rodentia are here grouped under families and published in condensed form for the purpose of inviting suggestions and criticisms as to arrangement, type species, and grouping of genera. The list is therefore merely an experiment. Although the names have been brought together, much remains to be done in working out the synonymy of types, but such work properly belongs to the specialist and the reviser of groups. When this has been done some examples of duplication of names will probably be found even more striking than the case of the lemmings, in which a single species (*Mus torquatus* Pallas) has served as the basis for five or six nominal genera.

As a help in distinguishing the names, extinct genera are printed in *italics;* an asterisk (*) indicates that the original description has not been seen; a dagger (†) that the name is preoccupied, and a double dagger (‡) prefixed to a family or subfamily that the name is not available, either because the genus on which it was based is preoccupied or because it is antedated by some other valid name.

[1] Forsyth Major has recently proposed *Nesomyinæ* for certain Old World mice usually classed under *Cricetinæ;* but as he does not give the limits of this group Thomas' classification is necessarily followed, although *Nesomyinæ* may be entitled to subfamily rank as much as the group under which it is placed.

## ANOMALURIDÆ.

**Anomalurina** Gervais, in D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 203, 1849.

**Anomaluridæ** Gill, Arrangement Fam. Mamm., p. 21, Nov., 1872.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Anomalurus** Waterhouse, 1843. | Anomalurus fraseri. |
| **Aroæthrus** Waterhouse, 1843.. | Suggested to replace Anomalurus, in case latter is preoccupied. |
| **Idiurus** Matschie, 1894..... | Idiurus zenkeri. |

## APLODONTIIDÆ.

**Haploodontidæ** Lilljeborg, Syst. Öfversigt Gnag. Däggdjuren, pp. 9, 41, 1866.

**Aplodontiidæ** Thomas, Proc. Zool. Soc. London, 1896, p. 1015 (1897).

**Aplodontia**[1] Richardson, 1829... Aplodontia leporina (=Anisonyx rufa Raf.)

## BATHYERGIDÆ.

**Bathyergina** Gervais, in D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 203, 1849.

**Bathyergidæ** Bonaparte, Conspectus Syst. Mastozoologiæ, 1850.

**Georhychinæ** Gill, Arrangement Fam. Mamm., p. 20, Nov., 1872.

‡ **Orycterideæ** Lesson, Nouv. Tableau Règne Animal, Mamm., p. 120, 1842.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Bathyergus** Illiger, 1811..... | Mus maritimus. |
| **Cœtomys** Gray, 1864..... | Bathyergus cæcutiens, B. damarensis. |
| **Cryptomys** Gray, 1864..... | Georychus holosericeus. |
| * **Fossor** Forster..... | (?) |
| **Georychus**[2] Illiger, 1811 ..... | Mus capensis (type), M. talpinus, M. aspalax. |
| † **Heliophobius** Peters, 1846..... | Heliophobius argenteo-cinereus. |
| **Heterocephalus** Rüppell, 1842. | Heterocephalus glaber. |
| **Myoscalops** Thomas, 1890.... | New name for Heliophobius Peters. |
| **Orycterus** Cuvier, 1829..... | Mus maritimus. |
| **Typhloryctes** Fitzinger, 1867.. | Georychus ochraceo-cinereus, Bathyergus cæcutiens. |

[1] Emended to Haplodon (Wagler, 1830), Aploudontia, Apludontia, Apluodontia, Haploodon, Haploudon, Hapludon, Haploudontia, Haplodus, Haploodus, Haploudus, and Hapludus. (See Coues, Century Dict., III, p. 2712.)

[2] Emended to Georhychus (Wagner, 1843).

## CASTORIDÆ.

**Castoridæ** Gray, London Medical Repository, XV, p. 302, April 1, 1821.
*Mylagaulidæ* Cope, Bull. U. S. Geol. & Geog. Surv. Terr., VI, No. 2, p. 362, Sept. 19, 1881.

| Name, authority, and date. | Type or included species. |
|---|---|
| * *Aulacodon* Kaup, 1832 | *Aulacodon typus.* |
| **Castor** Linnæus, 1758 | Castor fiber (type), C. moschatus. |
| * *Castoromys* Pomel, 1854 | *Chalicomys sigmodus.* |
| *Chalicomys* Kaup, 1832 | *Chalicomys jaegeri.* |
| *Chelodus* Kaup, 1832 | *Chelodus typus.* |
| † *Chloromys*(Meyer)Schlosser, 1884 | *Chalicomys eseri.* |
| *Conodontes* Laugel, 1862 | *Conodontes boisvilletti.* |
| † *Conodus* Gervais, 1867–'69 | Emended form of *Conodontes.* |
| *Diabroticus* Pomel, 1848 | *Diabroticus schmerlingii.* |
| *Eucastor* Leidy, 1858 | *Castor tortus.* |
| *Mylagaulus* Cope, 1878 | *Mylagaulus sesquipedalis.* |
| *Palæocastor* Leidy, 1869 | *Steneofiber nebrascensis.* |
| *Palaeomys* Kaup, 1832 | *Palaeomys castoroides.* |
| *Sigmogomphius* J. C. Merriam, 1896. | *Sigmogomphius leconteï.* |
| *Steneofiber* Geoffroy, 1834 | ——— |
| *Steneotherium* Geoffroy, 1833 | ——— |
| *Trogontherium* G. Fischer, 1809 | *Trogontherium cuvieri, T. werneri.* |

## CASTOROIDIDÆ.

*Castoroididæ* J. A. Allen, Mon. N. Am. Rodentia, p. 419, Aug., 1877.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Amblyrhiza* Cope, 1868 | *Amblyrhiza inundata.* |
| *Castoröides* Foster, 1838 | *Castoröides ohioensis.* |
| † *Leptomylus* Cope, 1869 | Misprint for *Loxomylus.* |
| *Loxomylus* Cope, 1869 | *Loxomylus longidens.* |

## CAVIIDÆ.

**Caviadæ** Gray, London Medical Repository, XV, p. 304, April 1, 1821.
**Hydrocharina** Gray, Thomson's Ann. Philos., XXVI, p. 341, Nov., 1825.
**Hydrochoeridæ** Gill, Arrangement Fam. Mammals, p. 22, Nov., 1872.
**Kerodontina** Gervais, in D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 204, 1849.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Anchymis* Ameghino, 1886 | *Cardiodon leidyi.* |
| **Anoëma** F. Cuvier, 1809 | Cavia cobaya. |
| ? *Callodontomys* Ameghino, 1889 | *Callodontomys vastatus.* |
| **Capiguara** Liais, 1872 | New name for Hydrochœrus. (Considered preferable by Liais because derived from the Indian name.) |

*Cardiatherium* Ameghino, 1883.. *Cardiatherium dæringi.*
† *Cardiodon* Ameghino, 1885..... *Cardiodon marshii, C. leidyi.* (See *Eucardiodon.*)
* *Cardiodus* Bravard, 1857..... *Cardiodus waterhousii, C. medius, C. minus, C. dubius.*
*Cardiomys* Ameghino, 1885..... *Cardiomys cavinus.*
**Cavia** Pallas, 1766..... Cavia cobaya.
*Caviodon* Ameghino, 1885..... *Caviodon multiplicatus.*
† **Ceratodon** Wagler, 1830..... Emended form for Kerodon.
**Cerodon** Wagler, 1830..... Emended form for Kerodon.
**Cobaya** Cuvier, 1817 ..... Cavia cobaya.
*Controcavia* Burmeister, 1885.... *Controcavia matercula.*
*Diocartherium* Ameghino, 1888.. *Diocartherium australe.*
**Dolichotis** Desmarest, 1819 ... Cavia patachonica.
*Eucardiodon* Ameghino, 1891... New name for *Cardiodon.*
**Galea** Meyen, 1833..... Galea musteloides.
**Hydrochaerus** Brisson, 1762... Sus hydrochoeris.
**Kerodon** F. Cuvier, 1823..... The 'Moco' of Geoffroy.
**Mara** D'Orbigny, 1829..... Dolichotis patagonica.
*Microcavia* Gervais & Ameghino, 1880. *Microcavia typus, M. robusta, M. intermedia, M. dubia.*
*Neoprocavia* Ameghino, 1889.... New name for *Procavia* Ameghino.
*Oromys* Leidy, 1853..... *Oromys æsopi.*
*Orthomyctera* Ameghino, 1889... *Cavia rigens, Orthomyctera vaga, Dolichotis lacunosa, Orthomyctera lata.*
*Palæocavia* Ameghino, 1889..... *Cavia impar, C. arita, Palæocavia pampæa, P. minuta.*
*Phugatherium* Ameghino, 1887 .. *Phugatherium cataclisticum.*
*Plexochœrus* Ameghino, 1886.... *Hydrochœrus paramensis.*
**Prea** Liais, 1872... .. ..... New name for Cavia. (Preferred by Liais because native name.)
*Procardiatherium* Ameghino, 1885 *Procardiatherium simplicidens.*
† *Procavia* Ameghino, 1885..... *Procavia mesopotamica.* (See *Neoprocavia.*)
**Scavia** Blumenbach, 1802..... Modified form of Cavia.
*Strata* Ameghino, 1886..... .... *Strata elevata.*

## CHINCHILLIDÆ.

**Chinchillidæ** Bennett, Proc. Zool. Soc. London, 1833, p. 58.
‡ **Eriomyidæ** Burmeister, Syst. Uebersicht Thiere Brasil., I, p. 188, 1854.
‡ **Lagostomidæ** "Bonaparte, Synopsis Vert. Syst., 1837."
**Viscachideæ** Lesson, Nouv. Tableau Règne Animal, Mamm., p. 104, 1842.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Briaromys* Ameghino, 1889..... | *Briaromys trouessartianus.* |
| **Callomys** D'Orbigny & Geoffroy, 1830. | Callomys viscacia, Mus laniger, Callomys aureus. |

**Chinchilla** Bennett, 1829..... Mus laniger.
*Colpostemma* Ameghino, 1891.... *Colpostemma sinuata.*
† *Epiblema* Ameghino, 1886..... *Epiblema horridula.* (See *Neoepiblema.*)
**Eriomys** Lichtenstein, 1829.... Eriomys chinchilla.
*Euphilus* Ameghino, 1889..... *Euphilus ambrosettianus, E. kurtzii.*
*Gyriabrus* Ameghino, 1891..... *Gyriabrus glutinatus.*
**Lagidium** Meyen, 1833 ... ... Lagidium peruanum.
**Lagostomus** Brookes, 1829 ... Lagostomus trichodactylus.
† **Lagotis** Bennett, 1833..... Lagotis cuvieri.
*Megamys* D'Orb. & Laurillard, 1842. *Megamys patagonensis.*
*Neoepiblema* Ameghino, 1889.... New name for *Epiblema* Ameghino.
*Perimys* Ameghino, 1887..... *Perimys crutus, P. onustus.*
*Pliolagostomus* Ameghino, 1887.. *Pliolagostomus notatus.*
*Potamarchus* Burmeister, 1885... *Potamarchus murinus.*
*Prolagostomus* Ameghino, 1887.. *Prolagostomus pusillus, P. divisus, P. profluens, P. imperialis.*
*Scotaeumys* Ameghino, 1887..... *Scotaeumys imminutus.*
*Sphæramys* Ameghino, 1887..... *Sphæramys irruptus.*
*Sphiggomys* Ameghino, 1887.... *Sphiggomys zonatus.*
*Sphodromys* Ameghino, 1887.... *Sphodromys scalaris.*
*Strophostephanos* Ameghino, 1891. *Strophostephanos iheringii.*
*Tetrastylus* Ameghino, 1886..... *Megamys? laevigatus.*
**Vizcacia**[1] Schinz, 1824 (?)..... Vizcacia pamparum.

## DASYPROCTIDÆ.

**Agoutidæ** Gray, London Medical Repository, XV, p. 304, April 1, 1821.
‡ **Chloromina** Gervais, in D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 204, 1849.
‡ **Cœlogenina** Gervais, in D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 204, 1849.
‡ **Cœlogenyidæ** Burmeister, Syst. Uebers. Thiere Brasil., I, p. 227, 1854.
**Dasyporcina** Gray, Thomson's Ann. Philos., XXVI, p. 341, Nov., 1825.
**Dasyproctina** Gray, List Spec. Mamm. Brit. Mus., pp. xxv, 124, 1843.
**Dasyproctidæ** Bonaparte, Conspectus Syst. Mastozoologiæ, 1850.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Agouti** Lacépède, 1801..... | Agouti paca (= Mus paca Linnæus). |
| **Cloromis** F. Cuvier, 1812..... | Includes the agoutis. |
| **Cœlogenus**[2] F. Cuvier, 1807... | Cœlogenus subniger, C. fulvus. |
| **Cutia** Liais, 1872 ..... ... | New name for Dasyprocta Illiger. |
| **Dasyprocta** Illiger, 1811..... | Cavia aguti, C. acuschy. |
| **Genyscœlus** Liais, 1872..... | Emended form for Cœlogenus. |
| **Osteopera** Harlan, 1825.... ... | Osteopera platycephala. |
| **Paca** Fischer, 1814 ..... | Paca maculata (= Cavia paca). |
| **Platypyga** Illiger, 1811.... ... | (?) |

[1] Viscacia Rafinesque, 1815 (nomen nudum), Rengger, 1830.

[2] Cælogenus (Griffith, 1827); Caelogenys (Agassiz, 1846); Coelogenys (Illiger, 1811); Genyscœlus (Liais, 1872).

## DINOMYIDÆ.

**Dinomyidæ** Alston, Proc. Zool. Soc. London, 1876, p. 96.
**Dinomys** Peters, 1873..... Dinomys branickii.

## DIPODIDÆ.[1]

**Dipodina** Bonaparte, "Synopsis Vert. Syst., 1837."
**Dipodidæ** Waterhouse, Ann. & Mag. Nat. Hist., X, p. 203, Nov., 1842.
**Dipodæ** Gervais; in D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 203, 1849.
**Dipsidæ** Gray, London Medical Repository, XV, p. 303, April 1, 1821.
‡ **Gerboidæ** Waterhouse, Charlesworth's Mag. Nat. Hist., III, p. 186, April, 1839.
‡ **Ierboidæ** Gray, Thomson's Am. Philos., XXVI, p. 341, Nov., 1825.
‡ **Jaculina** Carus, Handbuch Zool., p. 101, 1868.
‡ **Jaculidæ** Gill, Arrangement Fam. Mamm., p. 20, Nov., 1872.
**Sminthinæ** Alston, Proc. Zool. Soc. London, 1876, p. 80.
**Sminthidæ** Schulze, Schrift. Nat. Ver. Harz., Wernigerode, V, p. 24, 1890.
**Zapodidæ** Coues, Bull. U. S. Geol. & Geog. Surv. Terr., I, 2d ser., No. 5, p. 253, 1875.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Allactaga** Cuvier, 1836..... | Dipus allactaga. |
| **Beloprymnus** Gloger, 1841.... | New name for Allactaga. |
| **Cuniculus** Brisson, 1762..... | Dipus allactaga. |
| **Dipus** Schreber, 1782..... | Dipus jaculus, D. sagitta, D. cafer, D. meridianus, D. tamaricinus. |
| **Euchoreutes** W. L. Sclater, 1891. | Euchoreutes naso. |
| † **Halticus** Brandt, 1844..... | Dipus halticus. |
| **Haltomys** Brandt, 1844..... | Dipus aegyptius, D. hirtipes, D. macrotarsus, D. mauritanicus. |
| **Jaculus** Erxleben, 1777..... | Jaculus orientalis, J. giganteus, J. torridarum. |
| † **Meriones** Cuvier, 1825 ..... | Dipus americanus. |
| **Platycercomys** Brandt, 1844.. | Dipus platyurus. |
| **Pygeretmus** Gloger, 1841..... | Dipus platyurus. |
| **Scarturus** Gloger, 1841..... | 4-toed species of Dipus. |
| **Scirteta** Brandt, 1844... ..... | (?) |
| **Scirtetes** Wagner, 1841..... | New name for Allactaga Cuvier. |
| **Scirtomys** Brandt, 1844..... | Alactaga tetradactylus (= Scarturus Gloger, 1841). |
| **Scirtopoda** Brandt, 1844..... | Dipus halticus, D. aegyptius, D. hirtipes, D. macrotarsus, D. mauritanicus (= Halticus + Haltomys). |

[1] Sminthus represents the subfamily Sminthinæ, Zapus the Zapodinæ, and the other genera belong to the Dipodinæ.

**Sminthus** Keys. & Blasius, 1840. Sminthus nordmanni.
**Yerbua** Forster, 1778..... Yerbua tarsata (= Tarsius spectrum), Y. sibirica, Y. capensis (= Pedetes cafer), Mus meridianus, Yerbua kanguru (= Macropus giganteus); Mus longipes, M. jaculus, M. sagitta.
**Zapus** Coues, 1875..... Dipus hudsonius.

## EOCARDIDÆ.

*Eocardidæ* Ameghino, Revista Argentina, I, Ent. 3, p. 145, Junio, 1891.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Dicardia* Ameghino, 1891. ..... | *Dicardia maxima, D. modica, D. excavata.* |
| *Eocardia* Ameghino, 1887..... | *Eocardia montana.* |
| *Hedymys* Ameghino, 1887..... | *Hedymys integrus.* |
| *Phanomys* Ameghino, 1887..... | *Phanomys mixtus.* |
| *Procardia* Ameghino, 1891 ..... | *Eocardia eliptica.* |
| *Schistomys* Ameghino, 1887..... | *Schistomys erro.* |
| *Tricardia* Ameghino, 1891..... | *Eocardia divisa.* |

## ERETHIZONTIDÆ.

‡ **Cercolabina** Gray, List Spec. Mamm. Brit. Mus., pp. xxiv, 123, 1843.
‡ **Cercolabinæ** Gill, Arrangement Fam. Mamm., p. 22, Nov., 1872.
‡ **Cercolabidæ** Ameghino, Enum. Sist. Mam. Fós. Patagonia Austral, p. 9, Dic. 1887.
**Chætomyinæ** Thomas, Proc. Zool. Soc. London, 1896, 1026 (1897).
**Coendidæ** Trouessart, Cat. Mamm. tam viv. quam foss., fasc. III, p. 619, Oct., 1897.
**Erethizontina** Bonaparte, Conspectus Syst. Mastozoologiæ, 1850.
**Erethizontidæ** Thomas, Proc. Zool. Soc. London, 1896, 1025 (Apr., 1897).
‡ **Sphingurinæ** Alston, Proc. Zool. Soc. London, 1876, p. 93.
‡ **Synetherina** Gervais, in D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 204, 1849.
‡ **Synetherinæ** Trouessart, Cat. Mamm. Viv. et Foss., Rongeurs, p. 182, 1881.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Acaremys* Ameghino, 1887..... | *Acaremys murinus, A. minutus, A. minutissimus.* |
| **Cercolabes** Brandt, 1835..... | New name for Coendou Lacépède, 1801. |
| **Chætomys** Gray, 1843..... | Hystrix subspinosus. |
| **Coendou**[1] Lacépède, 1801..... | Hystrix prehensilis. |
| **Echinoprocta** Gray, 1865..... | Erethizon rufescens. |
| **Echinothrix** Brookes, 1828. .. | Hystrix dorsata. |

[1] Emended to Coendous (Temminck, 1820); Coëndus (Illiger, 1815); Cœndus (Rafinesque, 1815); Cuandu (Liais, 1872).

**Erethizon**[1] F. Cuvier, 1822..... Hystrix dorsata.
*Hystricops* Leidy, 1858..... *Hystrix venustus.*
**Onychura** Brookes, 1828..... Onychura spinosa.
**Plectrochœrus** Pictet, 1843 ... Plectrochœrus moricandi.
*Sciamys* Ameghino, 1887..... *Sciamys principalis, S. varians.*
**Sincetherus**[2] F. Cuvier, 1822... Hystrix prehensilis.
**Sphiggurus**[3] F. Cuvier, 1822... Sphiggurus spinosus,
*Steiromys* Ameghino, 1887... ... *Steiromys detentus, S. duplicatus.*

## GEOMYIDAE.

**Geomyina** Bonaparte, Conspectus Syst. Mastozoologiæ, 1850.
**Geomyinæ** Baird, Mamm. N. Am., pp. xxx, 366, 1857.
**Geomyidæ** Gill, Arrangement Fam. Mamm., p. 21, Nov., 1872.
‡ **Pseudotomina** Gray, Thomson's Ann. Philos., XXVI, p. 342, 1825.
‡ **Pseudostomidæ** Gervais, Ann. Sci. Nat., Paris, 3e ser., XX, p. 245, 1853.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Ascomys** Lichtenstein, 1825... | Ascomys canadensis (= Mus bursarius). |
| **Cratogeomys** Merriam, 1895... | Geomys merriami. |
| **Diplostoma** Rafinesque, 1817.. | Diplostoma fusca (= Mus bursarius). |
| **Geomys** Rafinesque, 1817..... | Geomys pinetis (= Mus tuza Ord). |
| *Gymnoptychus* Cope, 1873..... | *Gymnoptychus chrysodon, G. nasutus, G. trilophus,* and *G. minutus.* |
| *Heliscomys* Cope, 1873..... | *Heliscomys vetus.* |
| **Heterogeomys** Merriam, 1895. | Geomys hispidus. |
| **Macrogeomys** Merriam, 1895.. | Geomys heterodus. |
| **Orthogeomys** Merriam, 1895... | Geomys scalops. |
| **Oryctomys** Eydoux & Gervais, 1836. | Five subgenera: Diplostoma, Saccophorus, Saccomys, Poephagomys, Ctenomys. |
| **Pappogeomys** Merriam, 1895.. | Geomys bulleri. |
| **Platygeomys** Merriam, 1895... | Geomys gymnurus. |
| **Pseudostoma** Say, 1823..... | Pseudostoma bursaria |
| **Saccophorus** Kuhl, 1820..... | Mus bursarius. |
| **Thomomys** Maximilian, 1839.. | Thomomys rufescens. |
| *?**Tucanus** Rafinesque, 1815..... | Nomen nudum? |
| **Zygogeomys** Merriam, 1895... | Zygogeomys trichopus. |

[1] Emended to Erethison (Waterhouse, 1839); Eretison (McMurtrie, 1831); Eretizon (Cuvier, 1825); Erythizon (Alston, 1876).

[2] Emended to Sinetheres (Agassiz, 1842); Sincetherus (Cuvier, 1825); Synætheres (Gervais, 1859); Synetheres (G. Cuvier, 1829); Synœtheres (Lund, 1839).

[3] Emended to Sphingurus (Waterhouse, 1848); Spiggurus (Gray, 1847); Spigurus (Swainson, 1835).

## GLIRIDÆ.[1]

**Gliridæ** Thomas, Proc. Zool. Soc. London, 1896, 1016 (1897).
‡ **Myosidæ** Gray, London Medical Repository, XV, p. 303, April 1, 1821.
‡ **Myoxidæ** Waterhouse, Charlesworth's Mag. Nat. Hist., III, p. 184, April, 1839.
**Platacanthomyinæ** Alston, Proc. Zool. Soc. London, 1876, p. 81.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Bifa** Lataste, 1885. | Bifa lerotina. |
| *Brachymys* Meyer, 1847. | New name for *Micromys* Meyer, 1846. |
| *Cænomys* (Bravard MS.) Lydekker, 1885. | *Cænomys typus* (= *Myoxus murinus*). |
| **Claviglis** Jentink, 1888. | Claviglis crassicaudatus. |
| **Eliomys** Wagner, 1843. | Myoxus melanurus. |
| **Glis** Brisson, 1762. | Sciurus glis. |
| **Graphiurus** F. Cuvier, 1838. | Graphiurus capensis. |
| *†*Micromys* Meyer, 1846. | *Micromys ornatus.* (See *Brachymys.*) |
| **Muscardinus** Kaup, 1829. | Myoxus muscardinus. |
| **Myoxus** Schreber, 1782. | Myoxus glis, M. dryas, M. nitela, M. muscardinus. |
| **Platacanthomys** Blyth, 1859. | Platacanthomys lasiurus. |
| **Typhlomys** Milne Edwards, 1877. | Typhlomys cinereus. |

## HETEROMYIDÆ.

**Dipodomyna** Gervais, Ann. Sci. Nat., Paris, 3ème ser., XX, p. 245, 1853.
**Dipodomyinæ** Coues, Proc. Acad. Nat. Sci. Phila., 1875, p. 277.
**Heteromyina** Gray, Proc. Zool. Soc. London, 1868, p. 201.
**Heteromyinæ** Alston, Proc. Zool. Soc. London, 1876, p. 88.
**Heteromyidæ** Allen, Bull. Am. Mus. Nat. Hist. N.Y., V, p. 233, Sept. 21, 1893.
**Perognathidinæ** Coues, Proc. Acad. Nat. Sci. Phila., 1875, pp. 277–278.
‡ **Saccomyna** Gray, List. Spec. Mamm. Brit. Mus., pp. xxiv, 120, 1843.
‡ **Saccomyidæ** Baird, Mamm. N. Am., pp. xxx, 365, 1857.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Abromys** Gray, 1868..... ... | Abromys lordi. |
| **Chætodipus** Merriam, 1889.... | Perognathus spinatus. |
| **Cricetodipus** Peale, 1848..... | Cricetodipus parvus. |
| **Dasynotus** Wagler, 1830..... | Mus anomalus. |
| **Dipodomys** Gray, 1841..... | Dipodomys phillipii |
| **Dipodops** Merriam, 1890..... | Dipodomys agilis. |
| ? *Entoptychus* Cope, 1878..... | *Entoptychus cavifrons, E. planifrons, E. crassiramis.* |
| **Heteromys** Desmarest, 1817... | Mus anomalus. |
| **Macrocolus** Wagner, 1844..... | Macrocolus halticus. |

[1] Platacanthomys and Typhlomys belong to the Platacanthomyinæ, the others to the Glirinæ.

**Microdipodops** Merriam, 1891. Microdipodops megacephalus.
**Otognosis** Coues, 1875..... Otognosis longimembris.
**Perodipus** Fitzinger, 1867..... Dipodomys agilis.
**Perognathus** Maximilian, 1839. Perognathus fasciatus.
*Pleurolicus* Cope, 1878..... *Pleurolicus sulcifrons.*
**Saccomys** F. Cuvier, 1823..... Saccomys anthophilus.

## HYSTRICIDAE.

**Histricidæ** Gray, London Med. Repository, XV, p. 304, April 1, 1821.
**Hystrixideæ** Lesson, Nouv. Tableau Règne Animal, Mamm., p. 96, 1842.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Acantherium** Gray, 1847..... | Acanthion javanicum, A. flemingii. |
| **Acanthion** Cuvier, 1822..... | Acanthion javanicum. |
| **Acanthochoerus** Gray, 1866... | Acanthochoerus bartlettii, A. grotei. |
| **Atherurus** F. Cuvier, 1829..... | Hystrix fasciculata. |
| * **Eucritus** G. Fischer, 1817..... | (?) |
| *Hystricotherium* Croizet, 1853 ... | *Hystrix refossa.* |
| **Hystrix** Linnæus, 1758..... | Hystrix cristata, H. prehensilis, H. dorsata, H. macroura, H. brachyura. |
| *Lamprodon* Wagner, 1848..... | *Lamprodon primigenius.* |
| **Œdocephalus** Gray, 1866..... | Acanthion cuvieri. |
| * *Oreomys* Aymard, 1854..... | *Oreomys claveris.* |
| **Trichys** Günther, 1876..... | Trichys lipura. |

## ISCHYROMYIDÆ.

*Ischyromyidæ* Alston, Proc. Zool. Soc. London, 1876, pp. 67, 78.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Colonomys* Marsh, 1872..... | *Colonomys celer.* |
| *Colotaxis* Cope, 1873..... | *Colotaxis cristatus.* |
| *Ischyromys* Leidy, 1856..... | *Ischyromys typus.* |
| ? *Mysops* Leidy, 1871..... | *Mysops minimus.* |
| *Paramys* Leidy, Nov. 28, 1871.. | *Paramys delicatus, P. delicatior, P. delicatissimus.* |
| *Pseudotomus* Cope, 1872..... | *Pseudotomus hians.* |
| *Sciuravus* Marsh, June 21, 1871. | *Sciuravus nitidus, S. undans.* |
| ? *Sciuromys* Schlosser, 1884 .. ... | *Sciuromys cayluxi.* |
| *Syllophodus* Cope, 1881..... | New name for *Mysops* Leidy, 1871 (erroneously said to be preoccupied). |
| *Taxymys* Marsh, 1872..... | *Taxymys lucaris.* |
| *Tillomys* Marsh, 1872..... | *Tillomys senex, T. parvus.* |

## LEPORIDÆ.

**Lagidæ** Schulze, Helios, XIV, p. 82, 1897.
**Leporidæ** Gray, London Medical Repository, XV, p. 304, April 1, 1821.
**Lepusidæ** Gervais, Ann. Sci. Nat., 3me ser., XX, p. 246, 1853.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Caprolagus** Blyth, 1845..... | Lepus hispidus. |
| **Chionobates** Kaup, 1829..... | Lepus variabilis, L. borealis. |
| † **Cuniculus** Gloger, 1841.. ..... | Lepus cuniculus. |
| **Eulagos** Gray, 1867..... | Lepus mediterraneus, L. judææ. |
| † **Hydrolagus** Gray, 1867 ..... | Lepus aquaticus (type), L. palustris. (See Limnolagus). |
| **Lagopsis** Rafinesque, 1815..... | Nomen nudum. |
| * **Lagos** Brookes, 1828..... | Lepus arcticus. |
| *Lagotherium* Croizet, 1853..... | *Lepus issiodorensis, L. neschersensis.* |
| **Lepus** Linnæus, 1758..... | Lepus timidus, L. cuniculus, L. capensis, L. brasiliensis. |
| **Limnolagus** Mearns, 1897..... | New name for Hydrolagus Gray, 1867. |
| **Macrotolagus** Mearns, 1895... | Lepus alleni. |
| **Microlagus** Trouessart, 1897... | Lepus cinerascens. |
| **Oryctolagus** Lilljeborg, 1873... | Lepus cuniculus. |
| *Palaeolagus* Leidy, 1856..... | *Palaeolagus haydeni.* |
| *Panolax* Cope, 1874 ..... | *Panolax sanctæfidei.* |
| *Praotherium* Cope, 1871..... | *Praotherium palatinum.* |
| **Romerolagus** Merriam, 1896... | Romerolagus nelsoni. |
| **Sylvilagus** Gray, 1867. .. .... | Lepus nanus (= L. americanus), L. artemisia (= L. nuttalli), L. bachmani. |
| **Tapeti** Gray, 1867..... | Lepus brasiliensis. |
| *Tricium* Cope, 1873..... | *Tricium avunculus, T. leporinum, T. paniense.* |

## LOPHIOMYIDÆ.

**Lophiomyidæ** Gill, Arrangement Fam. Mamm., p. 20, Nov., 1872.

**Lophiomys** Milne Edwards, Feb. 6, 1867. Lophiomys imhausii.
**Phractomys** Peters, Feb., 1867..... Phractomys aethiopicus.

## MURIDÆ.

### CRICETINÆ.

**Cricetina** Gray, Thomson's Ann. Philos., XXVI, p. 342, Nov., 1825.
**Cricetinæ** Alston, Proc. Zool. Soc. London, 1876, p. 82.
**Cricetidæ** Zittel, Handbuch d. Palæontologie, IV, 2te Lief., p. 534, 1893.
**Hesperomyidæ** Ameghino, Mam. Fós., in Actas Acad. Nac. Ciencias, Córdoba, VI, p. 109, 1889.
**Nesomyinæ** Forsyth Major, Proc. Zool. Soc. London, 1897, p. 718.
**Sigmodontinæ** Thomas, Proc. Zool. Soc. London, 1896, 1019 (1897).

| Name, authority, and date. | Type or included species. |
|---|---|
| **Abrothrix** Waterhouse, 1837... | Mus (Abrothrix) longipilis. |
| **Acromys** ('Wagner') Trouessart, 1881. | Synonym of Drymomys. |
| **Akodon** Meyen, 1833..... | Akodon boliviense. |
| **Baiomys** True, 1894..... | Hesperomys taylori. |

**Blarinomys** Thomas, 1896..... Oxymycterus breviceps.
**Brachytarsomys** Günther, 1875 Brachytarsomys albicauda.
**Brachyuromys** Forsyth Major, 1896. Brachyuromys ramirohitra.
† **Calomys** Waterhouse, 1837.... Mus (Calomys) bisulcatus.
**Chilomys** Thomas, 1897..... Oryzomys instans.
*Cricetodon* Lartet, 1851..... *Cricetodon sansaniensis, C. medium, C. minus.*
**Cricetulus** Edwards, 1867..... Cricetulus griseus.
**Cricetus** Zimmermann, 1777... Le Hamster.
*Decticus* Aymard, 1853..... *Decticus antiquus.*
**Deilemys** Saussure, 1860..... Hesperomys toltecus.
**Drymomys** Tschudi, 1844..... Drymomys parvulus.
**Eligmodontia**[1] F. Cuvier, 1837. Eligmodontia typus.
**Eliurus** Edwards 1885..... Eliurus myoxinus.
? *Eomys* Schlosser, 1884 ..... *Eomys zitteli.*
*Eumys* Leidy, 1856..... *Eumys elegans.*
**Euneomys** Coues, 1874..... Reithrodon chinchilloides.
**Gymnuromys** Forsyth Major, 1896 Gymnuromys roberti.
**Habrothrix** Wagner, 1843..... Emended form for Abrothrix.
**Hallomys** Jentink, 1879..... Hallomys audeberti.
**Hamster** Lacépède, 1801..... Hamster nigricans.
**Heligmodontia** Agassiz, 1846.. Emended form for Eligmodontia.
**Hesperomys** Waterhouse, 1839. Mus bimaculatus.
**Holochilomys** ('Brandt') Peters, 1861. Mus aquaticus, M. squamipes (modified form of Holochilus).
**Holochilus** Brandt, 1835 ..... Mus (Holochilus) leucogaster, M. anguya.
**Hypogeomys** Grandidier, 1869. Hypogeomys antimena.
**Ichthyomys** Thomas, 1893.... Ichthyomys stolzmanni.
* *Lithomys* Meyer, 1846..... *Lithomys parvulus.*
**Megalomys** Trouessart, 1881... Mus pilorides.
*† *Micromys* Aymard, 1848..... *Micromys minutus.* (See *Myotherium.*)
* *Myarion* Pomel, 1854..... *Myarion antiquum, M. musculoides, M. minutum, M. angustidens.*
*Myotherium* Aymard, 1853 ..... New name for *Micromys* Aymard, 1848.
**Myoxomys** Tomes, 1861..... Hesperomys (Myoxomys) salvinii.
**Mystromys** Wagner, 1841..... Mystromys albipes.
*Necromys* Ameghino, 1889 ..... *Necromys conifer.*
**Nectomys** Peters, 1861..... Mus squamipes, Nectomys apicalis.
† **Neomys** Gray, 1873..... Neomys panamensis.
**Neotomys** Thomas, 1894..... Neotomys ebriosus.
**Nesomys** Peters, 1870..... Nesomys rufus.
**Notiomys** Thomas, 1890..... Hesperomys (Notiomys) edwardsii.
**Nyctomys** Saussure, 1860..... Hesperomys sumichrasti.
**Ochetodon** Coues, 1874..... Mus humilis.

[1] Emended to *Eligmodon* (Thomas, 1896), *Elimodon* (Fitzinger, 1867), and *Heligmodontia* (Agassiz, 1846).

**Onychomys** Baird, 1857..... Hypudæus leucogaster.
* ?**Orycteromys** Pictet, 1842..... (?)
**Oryzomys** Baird, 1857..... Mus palustris.
**Oxymycterus** Waterhouse, 1837 Mus (Oxymycterus) nasutus.
* **Pelamys** Jourdan, 1867 (?)..... Pelamys remifer.
**Peromyscus** Gloger, 1841.. ... Peromyscus arboreus (= Cricetus myoides).
**Phyllotis** Waterhouse, 1837.... Mus (Phyllotis) darwini.
**Reithrodon**[1] Waterhouse, 1837. Reithrodon typicus, R. cuniculoïdes.
**Reithrodontomys** Giglioli, 1873 Reithrodon from North America.
**Rhipidomys** Tschudi, 1844.... Hesperomys leucodactylus.
**Scapteromys** Waterhouse, 1837 Mus (Scapteromys) tumidus.
**Sigmodon** Say & Ord, 1825.... Sigmodon hispidum.
**Sigmodontomys** J. A. Allen, 1897. Sigmodontomys alfari.
**Sitomys** Fitzinger, 1867..... Cricetus myoides.
**Thomasomys** Coues, 1884..... Hesperomys cinereus.
**Trinodontomys** Rhoads, 1894. Sitomys insolatus.
**Tylomys** Peters, 1866..... .... Hesperomys (Tylomys) nudicaudus.
**Vesperimus** Coues, 1874. ..... Hesperomys (Vesperimus) leucopus.
**Vesperomys** ('Coues') Alston, 1880. Modified form of Vesperimus.
**Zygodontomys** J. A. Allen, 1897 Oryzomys cherriei.

### DENDROMYINÆ.

**Dendromyinæ** Alston, Proc. Zool. Soc. London, 1876, p. 82.
**Deomyinæ** Lydekker, in Flower & Lydekker's Mamm., Living & Extinct, p. 473, 1891.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Dendromus** A. Smith, 1829.... | Dendromus typus. |
| **Deomys** Thomas, 1888..... | Deomys ferrugineus. |
| **Leimacomys**[2] Matschie, 1893.. | Leimacomys büttneri. |
| **Malacothrix** Wagner, 1843.... | New name for Otomys Smith, 1834. |
| † **Otomys** Smith, 1834..... | Otomys typicus, O. albicaudatus. |
| **Steatomys** Peters, 1846.. ..... | Steatomys pratensis. |

### GERBILLINÆ.

**Gerbillina** Gray, Thomson's Ann. Philos., XXVI, p. 342, Nov., 1825.
**Gerbillidæ** De Kay, Nat. Hist. New York, Zool., pt. I, pp. xv, 70, 1842.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Amphiaulacomys** Lataste, 1882. | Rhombomys pallidus. |
| **Dipodillus** Lataste, 1881..... | Gerbillus simoni. |
| **Endecapleura** Lataste, 1882... | Gerbillus garamantis. |
| **Gerbillus** Desmarest, 1804..... | Gerbillus ægyptius, G. canadensis, G. pyramidum. |
| **Hendecapleura** Thomas, 1883.. | Emended form for Endecapleura. |

[1] Emended to Rhithrodon (Lydekker, 1891), Rithrodon (Agassiz, 1846).
[2] Emended to Limacomys (Lydekker, 1894).

**Meriones** Illiger, 1811..... ... Dipus tamaricinus, D. meridianus.
**Pachyuromys** Lataste, 1880... Pachyuromys duprasi.
**Psammomys** Cretzschmar, 1828. Psammomys obesus.
**Rhombomys** Wagner, 1841.... Rhombomys pallidus.
**Tatera** Lataste, 1882..... Gerbillus indicus.

HYDROMYINÆ.

**Hydromyina** Gray, Thomson's Ann. Philos., XXVI, p. 341, Nov., 1825.
**Hydromyinæ** Alston, Proc. Zool. Soc. London, 1876, p. 80.
**Hydromysideæ** Lesson, Nouv. Tabl. Règne Animal, Mamm., p. 125, 1842.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Chrotomys** Thomas, 1895. . . . | Chrotomys whiteheadi. |
| **Hydromys** Geoffroy, 1805..... | Mus coypus, Hydromys chrysogaster, H. leucogaster. |
| **Xeromys** Thomas, 1889..... | Xeromys myoides. |

MICROTINÆ.

‡ **Arvicolidæ** Gray, London Med. Repository, XV, p. 303, April 1, 1821.
‡ **Ellobiinae**[1] Gill, Arrangement Fam. Mamm., p. 20, Nov., 1872.
**Lemnina** Gray, Thomson's Ann. Philos., XXVI, p. 342, Nov., 1825.
**Microtinæ** Rhoads, Am. Nat., XXIX, p. 940, Oct., 1895.
Miller, N. Am. Fauna, No. 12, p. 8, July, 1896.
‡ **Ondatrina** Gray, Thomson's Ann. Philos., XXVI, p. 341, Nov., 1825.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Agricola** Blasius, 1857. ..... | Arvicola agrestis. |
| **Alticola** Blanford, 1881..... | Arvicola stoliczkanus. |
| **Alviceola** Blainville, 1817.. ... | 'Le genre campagnol.' (Misprint for Arvicola?) |
| **Ammomys** Bonaparte, 1831... | New name for Psammomys Le Conte. |
| *Anaptogonia* Cope, 1871..... . | *Arvicola hiatidens.* |
| **Anteliomys** Miller, 1896..... | Microtus chinensis. |
| **Arvicola** Lacépède, 1801..... | Mus amphibius (= M. terrestris Linn.) |
| **Aulacomys** Rhoads, 1894 . ... | Aulacomys arvicoloides. |
| **Bicunedens** Hodgson, 1863.... | Bicunedens perfuscus (nomen nudum = Neodon sikimensis). |
| **Borioikon** Poliakoff, 1881..... | Myodes torquatus. |
| **Brachyurus** Fischer, 1813..... | Mus arvalis, M. rutilus, M. amphibius, M. lemmus, M. torquatus, M. alliarius, Brachyurus blumenbachii, B. fulvus, B. niloticus. |
| *Bramus* Pomel, 1892..... ..... | *Bramus barbarus.* |
| † **Campicola** Schulze, 1890 ..... | Arvicola arvalis, A. subterraneus, A. campestris. |
| **Chilotus** Baird, 1857.. .. .... | Arvicola oregoni. |

[1] Preoccupied by Ellobiinæ, a subfamily of Mollusks. See Adams, Gen. Recent Moll., II, p. 237, 1858.

* **Chthonoergus** Nordmann, 1839. Mus murinus (= M. talpinus Pallas).
† **Cuniculus** Wagler, 1830..... Mus lemmus, M. torquatus (type), M. aspalax. (See Borioikon, Dicrostonyx, Misothermus, Tylonyx.)
**Dicrostonyx** Gloger, 1841..... Mus hudsonius?
† **Ellobius** Fischer, 1814..... Mus talpinus (type), Ellobius zocor (= Mus aspalax), Mus capensis, M. hudsonius.
**Eothenomys** Miller, 1896..... Microtus melanogaster.
**Eremiomys** Poliakoff, 1881 ... Georychus luteus, Mus lagurus (type).
**Evotomys** Coues, 1874..... Mus rutilus.
**Fiber** Cuvier, 1800..... Castor zibethicus.
*† **Glareolus** Oken, 1816..... Mus arvalis, M. campestris?
**Hemiotomys** Sélys-Longchamps, 1836. Arvicola fulvus (= A. arvalis), A. amphibius (= A. terrestris).
**Hyperacrius** Miller, 1896..... Microtus fertilis.
**Hypudaeus** Illiger, 1811..... Mus lemmus, M. amphibius (= M. terrestris), M. arvalis.
*Isodelta* Cope, 1871..... ..... *Arvicola speothen.*
**Lagurus** Gloger, 1841..... Lagurus migratorius (= Mus lagurus Pall. ?)
**Lasiopodomys** Lataste, 1887.. Arvicola brandti.
**Lemmomys** Lesson, 1842 ..... Mus talpinus.
* **Lemmus** Link, 1795..... Mus socialis, M. lagurus, M. lemmus (type), M. torquatus, M. glareolus, M. hudsonius.
**Microtus** Schrank, 1798..... Mus terrestris (= M. arvalis Pall., type), M. amphibius (= M. terrestris Linn.), M. gregarius (= M. arvalis Pall. ?)
† **Micrurus** Forsyth Major, 1876. Arvicola nebrodensis.
**Mictomys** True, 1894..... Mictomys innuitus.
**Misothermus** Hensel, 1855..... Myodes torquatus.
**Mussascus** Oken, 1816..... Ondatra americana (= Castor zibethicus).
**Mynomes**[1] Rafinesque, 1817... Mynomes pratensis (= Arvicola pennsylvanicus).
[**Myocastor** Kerr, 1792..... Mus Myocaster coypus (type), Mus M. zibethicus. (See Octodontidæ.)]
**Myodes** Pallas, 1811..... Mus lemmus, M. torquatus, M. lagurus, M. oeconomus, M. arvalis, M. saxatilis, M. gregalis, M. socialis, M. alliarius, M. rutilus.
* *Myolemmus* Pomel, 1854..... *Myolemmus ambiguus.*
**Neodon** Hodgson, 1849..... Neodon sikimensis.
**Neofiber** True, 1884..... Neofiber alleni.

[1] Emended to Myonomes (Coues, 1874).

**Ochetomys** Fitzinger, 1867.... Mus amphibius, Hypudæus pertinax, Arvicola destructor, Mus terrestris, Hypudæus nageri, Arvicola monticola, A. americanus.
* **Ondatra** Link, 1795..... Ondatra coypus, O. zibethicus.
† **Paludicola** Blasius, 1857..... Arvicola amphibius (= A. terrestris), A. nivalis, A. ratticeps.
**Pedomys** Baird, 1857..... Arvicola austerus.
* **Phaiomys** Blyth, 1863. ..... Phaiomys leucurus (= Microtus blythi Blan.)
**Phenacomys** Merriam, 1889... Phenacomys intermedius.
**Pinemys** Lesson, 1836.... .... Psammomys pinetorum.
**Pitymys** McMurtrie, 1831..... New name for Psammomys Le Conte.
† **Praticola** Fatio, 1867..... Arvicola amphibius (= A. terrestris), A. nivalis, A. arvalis, A. ratticeps, A. campestris.
† **Psammomys** Le Conte, 1830.... Psammomys pinetorum. (See Ammomys, Pinemys, Pitymys.)
* **Simotes** Fischer, 1829 (?).. ... (?)
† **Sylvicola** Fatio, 1867..... ... Arvicola agrestis.
**Synaptomys** Baird, 1857..... Synaptomys cooperi.
† **Terricola** Fatio, 1867 ..... Arvicola subterraneus, A. savii.
**Tetramerodon** Rhoads, 1894... Arvicola tetramerus.
**Tylonyx** Schulze, 1897..... Mus torquatus.

MURINÆ.

**Muridæ** Gray, London Medical Repository, XV, p. 303, April 1, 1821.
**Musideæ** Lesson, Nouv. Tableau Règne Animal, Mamm., p. 134, 1842.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Acanthomys** Lesson, 1842.... | Mus setifer, M. alexandrinus, Acanthomys perchal, Mus platythrix, M. hispidus. |
| † **Acanthomys** Gray, 1867..... | Acanthomys leucopus. |
| **Acomys** Geoffroy, 1838..... | Mus cahirinus. |
| **Acosminthus** Gloger, 1841.... | Mus cahirinus, M. dimidiatus. |
| **Apodemus** Kaup, 1829..... | Mus agrarius. |
| **Arvicanthis** Lesson, 1842..... | Lemmus niloticus. |
| **Bandicota** Gray, 1873..... | Bandicota gigantea. |
| **Batomys** Thomas, 1895..... | Batomys grantii. |
| **Carpomys** Thomas, 1895. ..... | Carpomys melanurus. |
| **Chiropodomys** Peters, 1868... | Chiropodomys penicillatus. |
| **Chiruromys** Thomas, 1888..... | Chiruromys forbesi. |
| **Conilurus** Ogilby, 1838..... | Conilurus destructor. |
| **Crateromys** Thomas, 1895..... | Phlœomys schadenbergi. |
| **Craurothrix** Thomas, 1895..... | New name for Echiothrix Gray, 1867. |
| **Cricetomys** Waterhouse, 1840. | Cricetomys gambianus. |
| **Dasymys** Peters, 1875..... | Dasymys gueinzii. |

† **Echiothrix**[1] Gray, 1867..... Echiothrix leucura. (See Craurothrix.)
? *Elomys* Aymard, 1848.... ..... *Elomys priscus.*
**Epimys** Trouessart, 1881..... 'Gymnomys et Acanthomys p. Gray, 1867' (57 species, including Mus caraco, decumanus, rattus, etc.).
**Euchætomys** Fitzinger, 1867.. Mus palmarum, M. novaræ, M. setifer, M. perchal, M. kok, M. hardwickii, M. rufescens, M. ellioti, M. lepidus, M. vittatus, M. pumilio, M. parduleus, M. zebra, Rattus donovani.
**Golunda** Gray, 1837..... Golunda ellioti, G. meltada, Mus barbara.
**Gymnomys** Gray, 1867 ..... Mus (Gymnomys) celebensis.
**Hapalomys** Blyth, 1859..... Hapalomys longicaudatus.
† **Hapalotis** Lichtenstein, 1829... Hapalotis albipes.
**Heliomys** Gray, 1873..... Heliomys jeudei.
**Isomys** Sundevall, 1842..... Mus variegatus (=Lemmus niloticus).
† **Lasiomys** Peters, 1866. ..... Lasiomys afer. (See Lophuromys.)
**Leggada** Gray, 1837..... Leggada booduga, Mus platythrix.
**Lemniscomys** Trouessart, 1881. Mus barbarus, pulchellus, zebra, lineatus, lineato-affinis, pumilio, trivirgatus, dorsalis, univittatus.
† *Lophiomys* Depéret, 1890..... *Lophiomys pyrenaicus.* (See *Trilophomys*).
**Lophuromys** Peters, 1874..... New name for Lasiomys Peters, 1866.
**Malacomys** Edwards, 1877.... Malacomys longipes.
**Mastacomys** Thomas, 1882.... Mastacomys fuscus.
**Micromys** Dehne, 1841..... .. Micromys agilis.
**Murinus** Rafinesque, 1815... . Nomen nudum.
**Mus** Linnæus, 1758..... Mus porcellus, M. leporinus, M. lemmus, M. marmota, M. monax, M. cricetus, M. terrestris, M. amphibius, M. rattus, M. musculus, M. avellanarius, M. sylvaticus, M. striatus, M. longipes, M. jaculus, M. volans.
**Musculus** Rafinesque, 1814 ... Musculus frugivorus, M. dichrurus. (Modified form, proposed to supercede Mus).
**Nannomys** Peters, 1876..... Mus (Nannomys) setulosus.
**Nesokia** Gray, 1842..... Mus hardwickii.
**Notomys** Lesson, 1842..... Dipus mitchellii.
**Pelomys** Peters, 1852.. ... ... Mus (Pelomys) fallax.
**Pithecheir**[2] Cuvier, 1838..... Pithecheir melanurus.
**Pogonomys** Edwards, 1877.... Mus (Pogonomys) macrourus.

[1] Echinothrix Alston, 1876.

[2] Emended to Pitcheir (Schinz, 1845), Pithechir (Jentink, 1892), Pithechirus (Agassiz, 1842), and Pithecochirus (Gloger, 1841).

**Pseudoconomys** Rhoads, 1896. Mus (Pseudoconomys) proconodon.
**Pseudomys** Gray, 1832..... Pseudomys australis.
**Rattus** Zimmermann, 1777..... Rattus somnolentus, R. migrans.
† **Saccostomus** Peters, 1846..... Saccostomus campestris.
**Spalacomys** Peters, 1861..... Spalacomys indicus.
? **Tenomys** Rafinesque, 1815.... Nomen nudum.
*Trilophomys* Depéret, 1892..... New name for *Lophiomys* Depéret, 1890.
**Uromys** Peters, 1867..... Mus macropus.
**Vandeleuria** Gray, 1842..... Mus oleraceus.

NEOTOMINÆ.

**Neotominæ** Merriam, Proc. Acad. Nat. Sci. Phila., pp. 228, Sept. 24, 1894.

| Name, authority, and date. | Type or included species. |
|---|---|
| ? *Bothriomys* Ameghino, 1889..... | *Bothriomys catenatus.* |
| **Hodomys** Merriam, 1894..... | Neotoma alleni. |
| **Nelsonia** Merriam, 1897 ..... | (See page 277.) |
| **Neotoma** Say & Ord, 1825..... | Mus floridanus. |
| ? *Paciculus* Cope, 1879..... | *Paciculus insolitus.* |
| *Ptyssophorus* Ameghino, 1889... | *Ptyssophorus elegans.* |
| **Teonoma** Gray, 1843.. ..... | Neotoma drummondii (= Myoxus drummondii). |
| *Tretomys* Ameghino, 1889..... | *Tretomys atavus.* |
| **Xenomys** Merriam, 1892..... | Xenomys nelsoni. |

OTOMYINÆ.

**Otomyinæ** Thomas, Proc. Zool. Soc. London, 1896, p. 1017 (1897).

| Name, authority, and date. | Type or included species. |
|---|---|
| ? **Euryotis** Brants, 1827..... | Mus irroratus. |
| **Oreinomys** Trouessart, 1881... | New name for Oreomys Heuglin, 1877. |
| † **Oreomys** Heuglin, 1877..... | Oreomys typus. |
| **Otomys** F. Cuvier, 1823..... | Two species, afterwards named Otomys unisulcatus (Sept., 1829), and O. bisulcatus (Oct., 1829). |

PHLŒOMYINÆ.

**Phlœomyinæ** Alston, Proc. Zool. Soc. London, 1876, p. 81.
**Phlœomys** Waterhouse, 1839.. Phlœomys cumingi.

RHYNCHOMYINÆ.

**Rhynchomyinæ** Thomas, Proc. Zool. Soc. London, 1896, p. 1017 (1897).
**Rhynchomys** Thomas, 1895... Rhynchomys soricoides.

SIPHNEINÆ.

**Siphneinæ** Gill, Arrangement Fam. Mammals, Nov., 1872, p. 20.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Myospalax** Blyth, 1846..... | Georychus fuscocapillus. |
| **Myotalpa** Kerr, 1792 ..... | Mus talpinus, M. capensis, M. maritimus, M. aspalax, Myotalpa typhla. |
| **Siphneus** Brants, 1827..... | Mus aspalax. |

## OCHOTONIDAE.

‡ **Lagidæ** Schulze, Helios, XIV, p. 82, 1897.
‡ **Lagomina** Gray, Thomson's Ann. Philos., XXVI, p. 341, Nov., 1825.
‡ **Lagomyidæ** Lilljeborg, Syst. Öfvers. Gnag. Däggdjuren, pp. 9, 58, 1866.
**Ochotonidæ** Thomas, Proc. Zool. Soc. London, 1896, p. 1026 (1897).

| Name, authority, and date. | Type or included species. |
|---|---|
| **Abra** Gray, 1863. ..... | Lagomys curzoniæ. |
| * *Amphilagus* Pomel, 1854..... | *Amphilagus antiquus.* |
| * *Lagodus* Pomel, 1854..... | *Lagodus picoides.* |
| † **Lagomys** G. Cuvier, 1800..... | Le pika (Lepus alpinus). |
| *Lagopsis* Schlosser, 1884..... | *Lagomys ocningensis, L. verus.* |
| * *Marunsiomys*[1] Croizet, 1853..... | (?) |
| *Myolagus* Hensel, 1856. ... .... | *Lagomys sardus.* |
| **Ochotona** Link, 1795..... | Lepus pusillus, L. alpinus, L. ochotona. |
| * **Pika** Lacépède, 1799..... | Lepus alpinus. |
| * *Platyodon* Bravard, 1853..... | Nomen nudum. |
| * *Prolagus* Pomel, 1854..... | *Lagomys sansaniensis.* |
| *Titanomys* Meyer, 1843 ..... | *Titanomys visenoviensis.* |

## OCTODONTIDÆ.[2]

‡ **Aulacodina** Bonaparte, Conspectus Syst. Mastozoologiæ, 1850.
**Capromyna** Gervais, D'Orbigny's Dict. Univ. d'Hist. Nat., XI, p. 204, 1849.

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[1] Emended (?) to *Marcuinomys* (Croizet, 1859).

[2] Considerable diversity of opinion exists as to the subdivisions of the Octodonts. Some authors arrange the genera in 3, and others in 4 groups.

**Capromyinæ**: *Adelphomys*, Aulacodus, Capromys, *Discolomys*, *Eumysops*, *Graphimys*, Guillinomys, *Gyrignophus*, Isodon, *Lomomys*, Mastonotus, *Morenia*, Myocastor, Myopotamus, Mysateles, *Neoreomys*, *Olenopsis*, Ondatra, *Orthomys*, *Paranomys*, Plagiodontia, Potamys, *Pseudoneoreomys*, *Scleromys*, *Spaniomys*, *Stichomys*, Triaulacodus, *Tribodon* (?), and Thryonomys.

**Ctenodactylinæ**: Ctenodactylus, Massoutiera, Pectinator, *Pellegrina*, Petromus, and *Ruscinomys* (?).

**Echimyinæ**: Carterodon, Cercomys, Dactylomys, Echimys, Isothrix, Kannabateomys, Lasiomys, Lasiuromys, Loncheres, Lonchophorus, Mesomys, Nelomys Jourdan, Nelomys Lund, Phyllomys, Platythrix, Pœcilomys, Thrichomys, and Thrinacodus.

**Octodontinæ**: Abrocoma, Aconaemys, *Actenomys*, Ctenomys, Dendrobius, *Diecelophorus*, *Dicolpomys*, Octodon, *Phtoramys*, *Pithanotomys*, *Platxomys*, Pœphagomys, Psammoryctes, Schizodon, and Spalacopus.

**Capromysideæ** Lesson, Nouv. Tabl. Règne Animal, Mamm., p. 124, 1842.
**Capromyidæ** Burmeister, Syst. Uebersicht Thiere Brasil., I, pp. 187, 189, 1854.
**Ctenodactylina** Gervais, Ann. Sci. Nat., 3me ser., XX, p. 245, 1853.
**Ctenodactylinæ** Gill, Arrangement Fam. Mamm., p. 22, Nov., 1872.
**Ctenodactylidæ** Zittel, Handb. der Palæont., IV, 2te Lief., p. 542, 1893.
**Ctenomysideæ** Lesson, Nouv Tabl. Règne Animal, Mamm., p. 105, 1842.
**Echymyna** Gray, Thomson's Ann. Philos., XXVI, p. 341, Nov., 1825.
**Echymyidæ** Bonaparte, Conspectus Syst. Mastozoologiæ, 1850.
**Echinomyidæ** Ameghino, Mam. Fos. Repub. Argentina, in Actas Acad. Nac. Ciencias, Cordoba, VI, p. 131, 1889.
**Loncheridæ** Burmeister, Syst. Uebers. Thiere Brasil., I, pp. 188, 192, 1854.
‡ **Muriformidæ** Ameghino, Enum. Sist. Especies Mam. Fós. Patagonia, p. 10, Dic., 1887.
**Myiopotamina** Bonaparte, Conspectus Syst. Mastozoologiæ, 1850.
**Octodontidæ** Waterhouse, Proc. Zool. Soc. London, 1839, p. 172.
‡ **Psammoryctina** Wagner, Wiegmann's Archiv f. Naturgesch., 1841, I.
‡ **Psammoryctidæ** Burmeister, Syst. Uebersicht Thiere Brasil., I, pp. 188, 212, 1854.
**Spalacopodidæ** Lilljeborg, Syst. Öfversigt Gnag. Däggdjuren, pp. 9, 44, 1866. (Spalacopodoïdes Brandt, 1855.)

| Name, authority, and date. | Type or included species. |
|---|---|
| **Abrocoma** Waterhouse, 1837.. | Abrocoma bennettii, A. cuvieri. |
| **Aconaemys** Ameghino, 1891... | New name for Schizodon Waterhouse. |
| *Actenomys* Burmeister, 1888..... | *Actenomys cuniculinus.* |
| *Adelphomys* Ameghino, 1887.... | *Adelphomys candidus.* |
| ‡ **Aulacodus** Temminck, 1827... | Aulacodus swinderianus. (See Thryonomys, Triaulacodus.) |
| **Cannabateomys** Lydekker, 1892. | Emended form for Kannabateomys. |
| **Capromys** Desmarest, 1822..... | Capromys fournieri. |
| **Carterodon** Waterhouse, 1848.. | Echimys sulcidens. |
| **Cercomys** Cuvier, 1829..... | Cercomys cunicularius. |
| **Ctenodactylus** Gray, 1830..... | Ctenodactylus massonii. |
| **Ctenomys** Blainville, 1826..... | Ctenomys brasiliensis. |
| **Dactylomys** I. Geoffroy, 1838.. | Dactylomys typus. |
| **Dendrobius** Meyen, 1833..... | Dendrobius degus. |
| *Dicælophorus* Ameghino, 1888.. | *Dicælophorus latidens, D. simplex, D celsus, Ctenomys priscus.* |
| *Dicolpomys* Winge, 1887..... | *Dicolpomys fossor.* |
| *Discolomys* Ameghino, 1889..... | *Discolomys cuneus.* |
| **Echimys**[1] Cuvier, 1809..... | Echimys cristatus, E. spinosus. |
| *Eumysops* Ameghino, 1888 ..... | *Eumysops plicatus, E. læviplicatus, E. robustus.* |
| *Graphimys* Ameghino, 1891..... | *Graphimys prorectus.* |
| **Guillinomys** Lesson, 1842..... | Guillinomys chilensis. |

[1] Emended to Echinomys (Wagner, 1840), Enchomys (Gloger, 1841).

| | |
|---|---|
| **Gundi** ('Fischer') Lataste, 1881 | A common name for Ctenodactylus, erroneously credited to Fischer as a genus. |
| *Gyrignophus* Ameghino, 1891 ... | *Gyrignophus complicatus.* |
| **Habrocoma** Wagner, 1842..... | Emended form for Abrocoma. |
| **Houtia** Agassiz, 1842..... .. | Nomen nudum. Native name for Capromys, included by Agassiz in list of genera, without reference or mention of species. |
| † **Isodon** Say, 1822..... | Isodon pilorides. |
| **Isothrix** Wagner, 1845..... | Isothrix bistriata, I. pachyura, I. pagurus. |
| **Kannabateomys** Jentink, 1891 | Dactylomys amblyonyx. |
| **Lasiomys** Burmeister, 1854.... | Lasiomys hirsutus. |
| **Lasiuromys** Deville, 1852..... | Lasiuromys villosus. |
| *Lomomys* Ameghino, 1891 ..... | *Lomomys crexus.* |
| **Loncheres**[1] Illiger, 1811..... | Loncheres paleacea, Hystrix chrysuros. |
| *Lonchophorus* Lund, 1839..... | *Lonchophorus fossilis.* |
| **Massoutiera** Lataste, 1885..... | Ctenodactylus mzabi. |
| **Mastonotus** Wesmael, 1841.... | Mastonotus popelairi (= Mus coypus.) |
| **Mesomys** Wagner, 1845..... | Mesomys ecaudatus. |
| *Morenia* Ameghino, 1886..... | *Morenia elephantina.* |
| **Myocastor** Kerr, 1792..... . | Mus (Myocastor) coypus (type), Mus (M.) zibethicus. |
| **Myopotamus** Geoffroy, 1805... | Myopotamus bonariensis. |
| **Mysateles** Lesson, 1842 ..... | Mysateles poeppingii (= Capromys prehensilis). |
| **Nelomys** Jourdan, 1837..... | Echimys cristatus. |
| † **Nelomys** Lund, 1841..... | Echimys antricola, E. sulcidens. (See Thrichomys.) |
| *Neoreomys* Ameghino, 1887..... | *Neoreomys australis, N. indirisus, N. decisus.* |
| **Octodon** Bennett, 1832.... ... | Octodon cumingii. |
| *Olenopsis* Ameghino, 1889..... | *Olenopsis uncinus.* |
| * **Ondatra** Link, 1795..... | Mus coypus, Castor zibethicus. |
| *Orthomys* Ameghino, 1881..... | *Orthomys dentatus.* |
| **Orycteromys**('Blainville')Agassiz, 1842. | Used by Blainville in 1826, only in the French form Oryctérome, for the genus described as Ctenomys. (See Orycteromys, p. 256.) |
| *Paranomys* (Scalabrini MS.) Ameghino, 1889. ..... | *Paranomys typicus.* |
| **Pectinator** Blyth, 1856.... ... | Pectinator spekei. |
| *Pellegrina* Gregorio, 1886..... | *Pellegrina panormensis.* |
| **Petromus** A. Smith, 1831..... | Petromus typicus. |
| *Phtoramys* Ameghino, 1887.. .. | *Phtoramys homogenidens.* |

[1] Emended to Loncherites (London Encyclopædia, 1845).

**Phyllomys** Lund, 1839..... Phyllomys brasiliensis (?)
*Pithanotomys* Ameghino, 1887... *Pithanotomys columnaris.*
**Plagiodontia**[1] F. Cuvier, 1836. Plagiodontia aedium.
* *Plataeomys* Ameghino, 1881..... *Plataeomys scindens.*
* **Platythrix** Pictet, 1842..... (?)
* **Pœcilomys** Pictet, 1842..... (?)
**Pœphagomys** F. Cuvier, 1834.. Pœphagomys ater.
**Potamys** Larranbaga, 1823. Le quyia of Azara (Myopotamus coypus).
**Psammoryctes** Pœppig, 1835.. Psammoryctes noctivagus (= Spalacopus pœppigii).
*Pseudoneoreomys* Ameghino, 1891 *Pseudoneoreomys pachyrhynchus, P. leptorhynchus, P. mesorhynchus.*
? *Ruscinomys* Depéret, 1890..... *Ruscinomys europæus.*
† **Schizodon** Waterhouse, 1842.. Schizodon fuscus. (See Aconaemys.)
*Scleromys* Ameghino, 1887..... *Scleromys angustus.*
**Spalacopus** Wagler, 1832 . .. Spalacopus pœppigii.
*Spaniomys* Ameghino, 1887..... *Spaniomys riparius, S. modestus.*
*Stichomys* Ameghino, 1887..... *Stichomys regularis, S. constans.*
**Thrichomys** Trouessart, 1881.. Thrichomys antricola, T. inermis, T. brevicauda.
**Thrinacodus** Günther, 1879... Thrinacodus albicauda.
**Thryonomys** Fitzinger, 1867... Aulacodus semipalmatus.
**Triaulacodus** Lydekker, 1896.. New name for Aulacodus Temminck, 1827. (See Thryonomys.)
*Tribodon* Ameghino, 1887..... *Tribodon clemens.*

## PEDETIDÆ.

‡ **Halamydæ** Gray, London Medical Repository, XV, p. 303, April 1, 1821.
**Pedestina** Gray, Thomson's Ann. Philos., XXVI, p. 342, Nov., 1825.
**Pedetidæ** Gill, Arrangement Fam. Mamm., p. 20, Nov., 1872.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Helamys** F. Cuvier, 1817..... | Mus cafer. |
| **Lagotis** Blainville, 1817 . ..... | 'La grande gerboise du Cap.' |
| **Pedetes** Illiger, 1811..... | Dipus cafer. |

## PSEUDOSCIURIDÆ.

*Pseudosciuridæ* Zittel, Handb. der Palæont., IV, 2te Lief., p. 523, 1893.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Adelomys* Gervais, 1853..... | *Theridomys vaillanti.* (See *Theridomyidæ.*) |
| ? *Decticadapis* Lemoine, 1883..... | *Decticadapis sciuroides.* |
| *Pseudosciurus* Hensel, 1856..... | *Pseudosciurus suevicus.* |
| *Sciurodon* Schlosser, 1884..... | *Sciurodon cadurcense.* |
| *Sciuroides* Forsyth Major, 1873.. | *Sciurus rutimeyeri, Sciuroides fraasi, S. siderolithicus, S. minimus.* |

[1] Emended to Plagiodon (Alston, 1876).

## SCIURIDÆ.

*Allomyidæ* Marsh, Am. Journ. Sci., 3d ser., XIV, p. 253, Sept., 1877.
**Arctomydæ** Gray, London Med. Repository, XV, p. 303, April 1, 1821.
**Arctomysideæ** Lesson, Nouv. Tabl. Règne Animal, Mamm., p. 115, 1842.
‡ **Campsiurina** Brandt, fide Carus, Handb. Zool., p. 96, 1868–'75.
*Leithiidæ* Lydekker, Proc. Zool. Soc. London, 1895, p. 862 (1896).
**Nannosciurinæ** Forsyth Major, Proc. Zool. Soc. London, 1893, pp. 187, 189.
**Pteromidæ** Anderson, Yunnan Exped., p. 278, 1879.
**Sciuridæ** Gray, London Medical Repository, XV, p. 304, April 1, 1821.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Allomys* Marsh, 1877..... ..... | *Allomys nitens.* |
| **Ammospermophilus** Merriam, 1892. | Tamias leucurus. |
| *Amphisciurus* (Bravard MS.) Lydekker, 1885..... | *Amphisciurus typus.* |
| **Anisonyx** Rafinesque, 1817.... | Anisonyx brachiura (= Arctomys columbianus). |
| **Arctomys** Schreber, 1780..... | Arctomys marmota, A. monax, A. bobac, A. empetra, A. citillus. |
| **Atlantoxerus** Forsyth Major, 1893. | Xerus getulus. |
| **Baginia** Gray, 1867..... | Sciurus platani. |
| **Callosciurus** Gray, 1867..... | Sciurus rafflesii. |
| **Callospermophilus** Merriam, 1897. | Sciurus lateralis. |
| **Citillus** Lichtenstein, 1827–'34. | Citillus mexicanus, C. leptodactylus, C. mugosaricus. |
| **Colobotis** Brandt, 1844..... | Spermophilus fulvus. |
| **Cynomys** Rafinesque, 1817.... | Cynomys socialis, C. grisea. |
| **Echinosciurus** Trouessart, 1880. | Sciurus hypopyrrhus (type), S. variabilis, S. stramineus. |
| **Eosciurus** Trouessart, 1880... | Sciurus bicolor (type), S. giganteus, S. indicus, S. maximus, S. macrurus. |
| **Eoxerus** Forsyth Major, 1893.. | Xerus laticaudatus, X. berdmorei, X. tristriatus, X. palmarum, X. insignis, X. hosei. |
| **Erythrosciurus** Gray, 1867.... | Sciurus ferrugineus, S. siamensis. |
| **Eupetaurus** Thomas, 1888..... | Eupetaurus cinereus. |
| **Eutamias** Trouessart, 1880..... | Tamias asiaticus (type), T. harrisi, T. lateralis, *T. laevidens.* |
| **Farunculus** ('Lesson') Gray, 1867. | Probably a misprint for Funambulus. |
| **Funambulus** Lesson, 1832..... | Funambulus indicus. |
| **Funisciurus** Trouessart, 1880.. | Sciurus lemniscatus. |
| **Geosciurus** A. Smith, 1834.... | Sciurus erythopus. |
| **Guerlinguetus** Gray, 1821..... | Sciurus guerlinguetus. |
| **Heliosciurus** Trouessart, 1880.. | Sciurus annulatus. |
| **Heterosciurus** Trouessart, 1880. | Sciurus ferrugineus. |

| | |
|---|---|
| **Ictidomys** J. A. Allen, 1877... | Spermophilus tereticaudus, S. mexicanus, S. 13-lineatus (type), S. franklini. |
| **Lagomys** Storr, 1780..... | "An unnatural and undefined combination of forms with squat bodies [including 24 species], but typified by species of Arctomys."—Gill. |
| † **Laria** Gray, 1867... ..... | Sciurus insignis. |
| *Leithia*[1] Lydekker, 1896..... | *Myoxus melitensis.* |
| **Lipura** Illiger, 1811..... | Hyrax hudsonius. |
| **Macroxus** Cuvier, 1823..... | Le guerlinguet et le toupaye. |
| * **Marmota** Blumenbach, 1779... | Marmota alpina, M. cricetus, M. lemmus, M. typhlus, M. capensis.[2] |
| *Meniscomys* Cope, 1878..... | *Meniscomys hippodus, M. multiplicatus.* |
| **Microsciurus** J. A. Allen, 1895. | Sciurus (Microsciurus) alfari. |
| **Monax** Warden, 1819..... | Monax missouriensis (= Cynomys ludovicianus). |
| **Nannosciurus** Trouessart, 1880. | Sciurus melanotis, S. exilis. |
| **Neosciurus** Trouessart, 1880... | Sciurus carolinensis (type), S. arizonensis, S. griseoflavus, S. aberti, S. fossor. |
| **Otocolobus** Brandt, 1844..... | Synonym of Colobotis (?). |
| **Otospermophilus** Brandt, 1844. | Spermophilus beecheyi. |
| *Palæosciurus* Pomel, 1854..... | *Sciurus* (*Palæosciurus*) *feignouxii, S.* (*P.*) *chalaniati.* |
| **Palmista** Gray, 1867..... | Sciurus palmarum, S. penicillatus, S. layardii, S. sublineatus. |
| **Parasciurus** Trouessart, 1880... | Sciurus niger. |
| **Paraxerus** Forsyth Major, 1893. | Xerus cepapi, X. palliatus, X. pyrropus, X. congicus, X. lemniscatus, X. isabella, X. boehmi. |
| **Petaurista** Link, 1795..... | Sciurus volucella, S. volans, S. hudsonius, S. petaurista (type), S. sagitta. |
| *Plesiarctomys* Bravard, 1848–'52. | *Plesiarctomys gerraisii.* |
| *Plesispermophilus* Filhol, 1883... | *Plesispermophilus angustidens.* |
| **Protoxerus** Forsyth Major, 1893. | Sciurus stangeri, S. ebii, S. aubinnii. |
| **Pteromys** G. Cuvier, 1800.... | Sciurus volans, S. petaurista. |
| **Pterotix** Rafinesque, 1815.. .. | Nomen nudum. |
| **Ratufa** Gray, 1867..... . | Sciurus indicus. |
| **Rheithrosciurus**[3] Gray, 1867.. | Sciurus macrotis. |
| **Rhinosciurus** Gray, 1843 ..... | Rhinosciurus tupaioides. |

[1] This genus is only provisionally referred to the Sciuridæ. Lydekker has recently suggested a special family, *Leithiidæ*, for it.

[2] From the 7th edition of the Handbuch d. Naturgeschichte, 1803. The first edition, 1779, not seen.

[3] Emended to Rhithrosciurus (Lydekker, 1891).

**Rukaia** Gray, 1867..... Sciurus macrourus, S. bicolor, S. ephippium.
**Sciuropterus** F. Cuvier, 1825.. Sciurus volans.
**Sciurus** Linnæus, 1758..... Sciurus vulgaris, S. niger, S. cinereus, S. flavus, S. getulus, S. striatus, S. volans.
**Spermophilopsis** Blasius, 1884. Spermophilus leptodactylus.
**Spermophilus** F. Cuvier, 1825. Mus citillus.
**Spermosciurus** Lesson, 1836... Includes 12 species, mostly from Africa.
*Stereodectes* Cope, 1869 ..... *Stereodectes tortus.*
**Tamias** Illiger, 1811..... Sciurus striatus.
**Tamiasciurus** Trouessart, 1880. Sciurus hudsonicus.
**Tenotis** Rafinesque, 1817..... Tenotis griseus (=Sciurus erithopus).
**Xerospermophilus** Merriam, 1892. Spermophilus mohavensis.
* **Xerus** Hemprich & Ehrenberg, 1832. Xerus brachyotus (and X. syriacus?).

## SPALACIDÆ.[1]

‡ **Aspalacidæ** Gray, Thomson's Ann. Philos., XXVI, p. 342, Nov., 1825.
**Aspalomyina** Waterhouse, Ann. & Mag. Nat. Hist., X, p. 203, 1842.
**Rhizomyinæ** Thomas, Proc. Zool. Soc. London, 1896, p. 1021 (1897).
**Spalacidæ** Gray, London Med. Repository, XV, p. 303, April 1, 1821.

| Name, authority, and date. | Type or included species. |
|---|---|
| **Aspalax** Desmarest, 1804..... | Mus typhlus. |
| * **Aspalomys** Laxmann..... | (?) |
| **Chrysomys** Gray, 1843..... | Bathyergus splendens. |
| **Nyctocleptes** Temminck, 1832. | Nyctocleptes dekan (=Mus sumatrensis). |
| **Ommatostergus** Nordmann, 1840. | Ommatostergus pallasii. |
| **Rhizomys** Gray, 1831..... | Rhizomys sinensis, R. sumatrensis. |
| **Spalax** Güldenstädt, 1770..... | Spalax microphthalmus (=S. typhlus Pall., 1778). |
| **Tachyoryctes** Rüppell, 1835... | Bathyergus splendens. |
| * **Talpoides** Lacépède, 1799..... | Mus typhlus. |
| *Typhlodon* Falconer, 1868..... | Nomen nudum (*Rhizomys sivalensis* Lydekker, 1878?) |

## THERIDOMYIDÆ.

*Theridomyidæ* Alston, Proc. Zool. Soc. London, 1876, pp. 70, 88.
*Trechomyinæ* Trouessart, Cat. Mamm. tam viv. quam foss, p. 392, 1897.

[1] Chrysomys, Nyctocleptes, Rhizomys, Tachyoryctes and *Typhlodon* belong to the Rhizomyinæ; Aspalax, Aspalomys, Ommatostergus, Talpoides, and Spalax to the Spalacinæ.

| Name, authority, and date. | Type or included species. |
|---|---|
| *Adelomys* Gervais, 1853..... | *Theridomys raillanti.* (See *Pseudosciuridæ.*) |
| *Archæomys* Laizer & Parieu, 1839. | New name for *Palæomys* Laiz. & Par. |
| *Blainvillimys* (Bravard MS.) Gervais, 1848–'52..... | *Theridomys blainvillei.* |
| *Cournomys* (Croizet) Zittel, 1893. | Synonym of *Issidioromys.* |
| *Cuvierimys* Bravard, 1848–'52.... | *Cuvierimys laurillardi.* |
| *Dipoides* Jäger, 1835..... .. ... | Species not named. |
| *Gergoviomys* (Croizet MS.) Blainville, 1840... ... ... ..... | Species not named. |
| * *Isoptychus* Pomel, 1854..... .. | *Theridomys* (*Isoptychus*) *jourdani*, *Isoptychus auberyi*, *I. antiquus*, *I. cuvieri*, *I. rassoni*, *Theridomys aquatilis* (?). |
| *Issidioromys* (Croizet MS.) Blainville, 1840..... .. | *Issidioromys pseudaxema* Gervais, 1848. |
| † *Neomys* Bravard, 1844..... | *Neomys lembronicus* (= *Theridomys lembronicus*). |
| *Nesokerodon* Schlosser, 1884..... | *Isiodoromys minor.* |
| * *Omegodus* Pomel, 1854..... | *Omegodus echimyoïdes.* |
| * *Palaxæma* Pomel, 1854..... | *Palaxæma antiquus.* |
| † *Palæomys* Laizer & Parieu, 1839.. | *Palæomys arvernensis.* (See *Archæomys.*) |
| * *Perrieromys* Croizet..... | (?) |
| *Protechimys* Schlosser, 1884..... | *Protechimys gracilis*, *P. major.* |
| *†*Tæniodus* Pomel, 1854..... | *Echimys cuvristriatus.* |
| *Theridomys* Jourdan, 1837..... | Species not named in first description. |
| *Trechomys* Lartet, 1869..... | *Trechomys bonduellii.* |

## INCERTÆ SEDIS.

| | |
|---|---|
| **Anotis** Rafinesque, 1815... ... | Nomen nudum. |
| *Archilagus* Haeckel, 1895..... | Hypothetical genus—'Atavus omnium Rodentium.' |
| *Asteromys*[1] Ameghino, 1897..... | *Asteromys punctus*, *A. prospicuus.* |
| *Budomys* ('Croizet') Bravard, 1843 | Nomen nudum. |
| *Cephalomys*[1] Ameghino, 1897.... | *Cephalomys arcidens*, *C. plexus.* |
| *Haplostropha* Ameghino, 1891... | *Haplostropha scalabriniana.* |
| *Hystriocomys* Giebel, 1860..... | *Hystriocomys thuringiacus.* |
| ? *Mixodectes*[2] Cope, 1883..... .. | *Mixodectes pungens*, *M. crassiculus.* |
| *Orchiomys*[1] Ameghino, 1897..... | *Orchiomys prostans.* |

[1] *Cephalomyidæ* Ameghino, Bol. Inst. Geog. Argentino, XVIII, p. 592, Oct. 6, 1897.

[2] *Mixodectidæ* Cope, Proc. Acad. Nat. Sci. Phila., p. 80, May 22, 1883.

"The discovery of some skeleton fragments in good association with a lower jaw of *Mixodectus pungens* makes it probable that this genus should be removed from the Primates and placed as an extremely primitive Rodent."—Matthew, Bull. Am. Mus. Nat. Hist. New York, IX, p. 265, 1897.

| | |
|---|---|
| *Palaiotrogus* Jäger, 1839..... | *Palaiotrogus steinheimensis.* |
| *Paradoxomys*[1] Ameghino, 1885.. | *Paradoxomys cancrivorus.* |
| *Protechynus* Filhol, 1891..... | Nomen nudum. |
| *Protoptychus*[2] Scott, 1895..... | *Protoptychus hatcheri.* |

[1] *Paradoxomyina* Ameghino, Bol. Acad. Nac. Cien., Córdoba, IX, p. 79, 1886.

*Paradoxomydæ* Ameghino, Mam. Fos. Repub. Argentina, in Actas Acad. Nac. Ciencias, Córdoba, VI, p. 122, 1889.

[2] "The genus is probably to be regarded as the ancestral type of the Dipodidæ, and indicates an American origin for this family."—Scott, Proc. Acad. Nat. Sci. Phila., 1895, p. 286.

VOL. XI, PP. 271-275 DECEMBER 17, 1897

PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

MARINE BIOLOGICAL WOODS HOLE LIBRARY

# *CERVUS ROOSEVELTI*, A NEW ELK FROM THE OLYMPICS.

BY C. HART MERRIAM.

For many years naturalists have known of the presence of Elk in the Olympic Mountains and other ranges along the Pacific coast, but until recently no specimen, so far as I am aware, has found its way to any museum. When in the Olympic Mountains last August I arranged with two trappers who had established a winter camp in the deep canyon of Hoh River, at the north foot of Mt. Olympus, to secure specimens as soon as the animals had put on the winter coat. The first of these—a fine old bull with massive antlers—has now arrived and is safely installed in our National Museum.

Dr. J. G. Cooper, in his report on the Mammals of the 47th and 49th Parallels, published in 1860, states that the Elk was abundant in the dense forests of the Coast Range, and adds: "An intelligent farmer, who formerly hunted Elk in New York State, told me that he considered these a different animal, being much larger and having larger and differently formed horns."* In the same volume Geo. Gibbs states that "Judge Ford, long a settler in Washington Territory and an enthusiastic hunter, says that the Elk of the Pacific coast is not the Elk of the 'plains,' but has a *larger and coarser head*. He has been through life familiar with game and is *positive* that they are different animals."† John Keast Lord, in his '*Naturalist in Vancouver Island and British Columbia*,' published in London in 1866, says: "The Wapiti on the Oregon coast grows much larger, and differs in color from the animal found on the inland mountains." Dr. James C. Mer-

* Pacific Railroad Reports, Vol. XII, Pt. II, p. 88, 1860.

† *Ibid.*, p. 133.

rill, Major and Surgeon U. S. Army, informs me that he also has seen numerous heads and antlers of the Olympic Elk, all of which were distinguishable at a glance from the common species.

In the Oregon exhibit of the World's Columbian Exposition at Chicago, in 1893, were several mounted heads of this Elk. They were examined by Hon. Theodore Roosevelt, who told me that they differed from those of the Rocky Mountain animal in being black and in having antlers with relatively straight beams and an irregular cluster of points at the tip instead of the usual incurved terminal prong.

Mr. Roosevelt, in his entertaining '*Wilderness Hunter*,' describes the Rocky Mountain Elk or Wapiti as "not only the most stately and beautiful of American game, but also the noblest of the stag kind throughout the world;" and adds: "Whoever kills him has killed the chief of his race, for he stands far above his brethren of Asia and Europe." These remarks must now be transferred from the common Wapiti to the Pacific coast animal.

Last summer, when engaged in field-work in the Puget Sound region, I saw several heads and a few hides of this Elk, and was surprised that such a superb species had remained so long undescribed. I deem it a privilege to name this splendid animal Roosevelt's Wapiti. It is fitting that the noblest deer of America should perpetuate the name of one who, in the midst of a busy public career, has found time to study our larger mammals in their native haunts and has written the best accounts we have ever had of their habits and chase.

**Cervus roosevelti** sp. nov. Roosevelt's Wapiti.

*Type* from Mt. Elaine (on ridge between heads of Hoh, Elwah, and Soleduc rivers) near Mt. Olympus, Olympic Mts., State of Washington.

*Type* No. 91579, ♂ ad., U. S. Nat. Mus., Biological Survey Coll. Collected Oct. 4, 1897 by Hans and Chris Emmet.

*General characters.*—Size large; head and legs black (probably only in winter pelage); skull and antlers massive; beams of antlers relatively short and straight, with terminal prong aborted.

*Description of type specimen* (which has nearly completed the molt from fall to winter pelage).—Face from between eyes to nose-pad, sooty blackish, somewhat grizzled on cheeks with golden-brown; eyelids black, surrounded by area of pale fulvous, incomplete anteriorly; rest of head and neck brown, becoming black along median line and mixed black and reddish on top of head; back and sides a peculiar grayish brown with incomplete dusky stripe along median dorsal line; breast and belly dull reddish chestnut; legs and feet sooty black with space between hoof and

dew claws fulvous, the fulvous reaching up a short distance along median line posteriorly; fore legs abruptly black from body to hoof, with a narrow fulvous patch on inner side of forearm; hind legs and feet sooty black, the black on inner side of thigh reaching up nearly to groin, and on posterior aspect reaching nearly to rump in a band 40–50 mm. wide which curves slightly outward on each side of lower part of rump patch; rump patch pale dull buffy-fulvous, deepening between thighs to pale tan; throat grizzled black and dark golden-brown, becoming darker anteriorly, with a narrow median beard (about 30 mm. broad) of pale fulvous, beginning opposite the angle of the mouth and sharply defined anteriorly and laterally by a blackish border, spreading and fading posteriorly; chin and lower lip blackish with a sharply defined wedge-shaped mark of buffy fulvous on each side of median line, its base at anterior edge of lip, its apex directed posteriorly. Metatarsal gland (situate 160 mm. below heel on outer side) a conspicuous oval patch of reddish fulvous about 80 mm. in length, enclosing a white central stripe 35 mm. in length, and surrounded by the black of the leg and foot.

*Cranial characters.*—The skull of *Cervus roosevelti*, compared with that of *C. canadensis* from the Rocky Mountains, is much larger, broader and more massive. The frontals are not only conspicuously broader but are *very much flatter*, giving the cranium a different profile. The muzzle also is much broader. The cavities in front of the orbits, on the other hand, are decidedly smaller.

*Measurements of type specimen.*—Total length, measured in flesh, 2490 mm. (= 8 ft. 2 in.); tail in dry skin about 80 mm.; ears in dry skin: from base posteriorly 225 mm., from base of opening 208 mm.

*Antlers:* Spread 990 mm. (= 3 ft. 3 in.); length of left beam from burr to tip 1050 (= 41¼ in.); circumference just above burr 285 mm. (= 11¼ in.); least circumference above bez-tine 190 mm. (= 7½ in.).

*Antlers.*—The antlers are large, heavy and relatively short, with the terminal prongs aborted, so that the total length from burr to tip is about 500 mm. (nearly 20 inches) less than in well formed antlers of the Rocky Mountain Elk. The brow, bez, trez, and 4th tine are similar to those of the ordinary Wapiti, but above the 4th the antler is flattened and sub-palmate and ends in 2 or 3 short points the tips of which reach only slightly above the tip of the 4th prong.

Whether the aborted condition of the terminal part of the antler in Roosevelt's Wapiti is the result of long residence in the dense Pacific coast forests, where longer antlers would be inconvenient, or is indicative of closer relationship with the stags of Europe and Asia, which normally carry somewhat similar antlers, is an interesting question.

Among some black heads in a taxidermist shop in Victoria I saw one, said to have been killed on Vancouver Island, in which

the terminal prong of the antlers is much longer than usual, approaching the normal condition of the Rocky Mountain animal. But it by no means follows that the antlers in question belong to the head on which they were mounted, for many taxidermists have a reprehensible habit of grafting handsome antlers on handsome heads irrespective of zoological or geographical obstacles. During the past three months I have seen more than a dozen mounted heads of Elk, Deer, and Antelope bearing horns which the taxidermists admitted were selected from stock in hand, without reference to the heads on which they grew.

*Other specimens.*—In the taxidermist shop of L. F. Richolt & Co., at Centralia, Washington, I examined a very beautiful hide of a Wapiti killed in winter in Chehalis County. The color of the back and sides was a beautiful clear bluish gray, with a tint suggesting lavender, and the legs where they had been cut off were abruptly black. The amount of black on the head varies considerably in different specimens. Probably part of this variation is due to age and part to season. All of the adult winter heads were black from nose to ears, with more or less black on the neck. Some had the entire neck black, the black reaching back to the breast and nearly to the shoulders. The development of the mane seems to be much as in the Rocky Mountain Wapiti.

*Geographic distribution.*—Roosevelt's Wapiti inhabits the dense coniferous forests of the humid Pacific coast strip from near the northern end of Vancouver Island southward through the coast ranges of Washington and Oregon to northwestern California. In 1860, according to George Gibbs, it followed the coast "all the way down to San Francisco" (Pacific Railroad Reports, vol. XII, Pt. II, p. 133). This is a very natural distribution, corresponding with that of many other species. Through the agency of man the southern part of the range has now been cut off, but just how far I am unable to say. Mr. Charles H. Townsend, in his important '*Field Notes on the Mammals, Birds, and Reptiles of Northern California*,' published in 1887, says that the Wapiti "still exists in moderate numbers in Mendocino, Humboldt, and Trinity counties, along the upper courses of the Eel, Elk, and Trinity rivers. Two large Elk were shot in Humboldt County in December, 1885, and brought to Eureka, where I saw them."*

* Proc. U. S. National Museum, X, pp. 168–169, 1887.

But the southern limit of its range is of far less consequence than the eastern limit, for the important question is, Do or do not the ranges of the Rocky Mt. and Pacific coast Wapiti come together? Apparently they do not. Some of the old reports state that the Pacific Elk formerly inhabited the Cascade range in Washington and Oregon. But even in this case the Cascades are separated, except at the north, by the full breadth of the Great Basin and Plains of the Columbia. North of the Columbia River the forest region of the northern Cascades is practically connected with that of the Rocky Mts. by means of the timber-covered parts of southern British Columbia and the Colville Indian reservation of northern Washington. But this region, so far as I can learn, is not, and never has been, inhabited by Elk. Mr. John Fannin, Curator of the Provincial Museum at Victoria, tells me that while Elk are common on Vancouver Island they do not occur anywhere in British Columbia except along its eastern border in the Rocky Mt. region.

At the time of my visit to the Olympics the latter part of August the Elk had been recently driven out of the upper Hoh and Soleduc canyons by Indians, and the numerous tracks seen were 10 days or 2 weeks old. Well-beaten trails followed the crests of the higher ridges and traversed the principal valleys. Many of these trails, with little labor, can be made available for horses and afford almost the only means of penetrating the region.

Mr. W. A. Perry has published the following account of the way Indians kill Elk in these mountains. He says: "The principal Indian method of hunting the Elk, in the Olympic Range, is by driving them over precipices. Selecting a well-known spot, on a well-traveled Elk-trail, they will lie in wait for weeks, until a band appears coming down the mountain. The place usually selected is one where the trail curves around some great rock, just at the edge of a precipice a hundred feet or more in height. A scout, stationed high up the mountain, gives notice of the approach of a band, and then the Indians mass at the lower end of the curve, while others conceal themselves above the curve. As soon as the band passes the latter, they spring to their feet, rush down the trail, yelling and firing guns. The Indians at the lower end of the curve do the same, and the Elk, finding themselves surrounded, leap over the cliff and are crushed on the rocks below."*

*The Big Game of North America. Edited by G. O. Shields. p. 53, 1890.

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PROCEEDINGS

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# *NELSONIA NEOTOMODON*, A NEW GENUS AND SPECIES OF MURINE RODENT FROM MEXICO.

BY C. HART MERRIAM.

The collection of mammals made in Mexico by Mr. E. W. Nelson still contains many novelties. Recently, in looking at the skull of a large White-footed Mouse from the mountains of Zacatecas, supposed to be a typical *Peromyscus*, I was startled to find that it had the flat-topped prismatic teeth of a Wood Rat, *Neotoma*. Closer examination of the dentition showed that while the 1st and 2d upper and 1st lower molars agree essentially with those of *Neotoma*, the 3d upper and 2d and 3d lower differ so materially that it is necessary to erect a new genus for the animal's reception. The skull also is peculiar and unlike either *Neotoma* or *Peromyscus*. The most important difference is in the antorbital slit, which does not notch the upper surface of the maxillary root of the zygoma. Another character is the production of the inferior angle of the antorbital slit to form a distinct process. The tail is large and blunt, much as in *Neotoma*—not tapering to a slender point as in *Peromyscus*.

The new genus may be defined as follows:

**Nelsonia** gen. nov.

*Type.*—*Nelsonia neotomodon* sp. nov., from Plateado, Zacatecas, Mexico.

*Diagnosis.*—Cranial characters: Skull in general resembling that of a large *Peromyscus* but flatter; zygomata heavier, less depressed, and more spreading anteriorly; antorbital slits relatively narrow and only faintly notching upper surface of maxillary root of zygoma; inferior angle of antorbital slit thickened and protruding forward and outward as a distinct process; audital bullæ sub-conical as in *Peromyscus* and *Hodomys*,

not bullate as in *Neotoma* and *Xenomys;* brain case depressed as in *Peromyscus,* not elevated as in *Neotoma, Xenomys,* and *Hodomys;* incisive foramina large and open, broader anteriorly than in *Neotoma* or *Peromyscus;* coronoid process of mandible small, hardly larger than in *Peromyscus.*

*Dental characters* (Fig. 14).—Teeth rooted, large, massive, and prismatic, with flat crowns presenting deep reëntrant angles of enamel (enamel of equal thickness throughout) as in *Neotoma* and *Xenomys*—totally different from the small tubercular teeth (with enamel of unequal thickness) of *Peromyscus.* Crowns of 1st and 2d upper and 1st lower molars with enamel pattern essentially as in *Neotoma, Hodomys,* and *Xenomys.* Crowns of 3d upper and 2d and 3d lower molars with enamel pattern unlike that of any known genus; 3d upper molar with a single very deep and narrow reëntrant angle on outer side, which pushes almost completely across the tooth, dividing the crown into two subtriangular lobes, the posterior of which is the larger; 2d lower molar with one reëntrant angle on each side, the inner deeper than, and passing anterior to, the outer, dividing the crown into two transverse loops the posterior of which is sometimes deeply notched on the inner side by a secondary reëntrant angle; 3d lower molar with a single and rather open reëntrant angle on inner side, reaching only half way across tooth, and a slight projection (without distinct reëntrant angle) on outer side.

Fig. 14.—*Molar teeth of Nelsonia neotomodon and Neotoma desertorum.* × 3.

*a* (upper) *b* (lower) molars of *Neotoma desertorum.*
*c* (upper) *d* (lower) molars of *Nelsonia neotomodon.*

*External characters.*—Size (of only known species) equalling largest species of *Peromyscus;* tail large and blunt as in *Neotoma,* and well haired, with terminal pencil larger than usual in *Peromyscus;* feet large, relatively as in *Neotoma*—decidedly larger than in *Peromyscus.*

### **Nelsonia neotomodon** sp. nov.

*Type* from mountains near Plateado, Zacatecas, Mexico. (Altitude about 2500 meters or 8200 feet.) No. 90891, ♂ ad. U. S. Nat. Mus., Biological Survey Coll. Collected Sept. 3, 1897, by E. W. Nelson and E. A. Goldman. Original No. 11625.

*General characters.*—Size, coloration, and general appearance similar to the larger species of *Peromyscus* (as *P. californicus*), but whiskers larger and coarser, tail larger and blunter, and feet larger; ears large and nearly naked; tail well haired, white-tipped, and with a distinct terminal pencil.

*Color.*—Upper parts grayish brown, conspicuously lined with black on rump and posterior half of back, and suffused along the sides with pale dull fulvous, which becomes intensified inferiorly so as to form a fairly distinct band between the gray of the back and white of the belly, reaching all the way from cheeks to thighs; under parts white, the hairs

plumbeous at base; fore and hind feet white; outer side of hind legs dusky to ankles; eyes surrounded by a narrow ring of black; white of upper lip reaching up on sides of nose half way to eye; tail sharply bicolor; dusky above, white below, and at tip all round.

*Cranial and dental characters.*—The cranial and dental characters have been so fully given in the generic diagnosis and are so well shown in the accompanying drawings that it will be unnecessary to describe them further unless a second species is discovered.

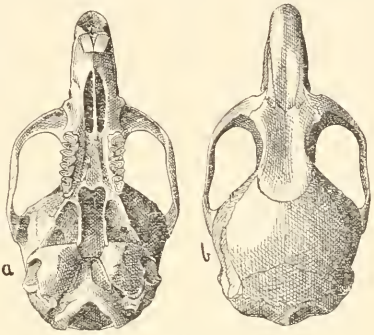

FIG. 15.—Skull of *Nelsonia neotomodon*. × 1½.

*Measurements.* — Type specimen, ♂ ad.: total length, 247; tail vertebræ, 121; hind foot, 29. Average of 6 specimens from type locality: total length, 244; tail vertebræ, 121; hind foot, 29.

*Geographic distribution.* — Specimens of this remarkable animal were collected by Mr. Nelson in the higher parts of the Sierra Madre in the western corner of the State of Zacatecas, and about 100 miles farther south in the same range, near Bolaños, Jalisco. Another series was obtained in a detached range, east of the Sierra Madre, near Plateado, Zacatecas. Mr. Nelson informs me that the animals were usually found about ledges or other rocky places in the pine forest, at an altitude of 8,000 feet or upwards. Near Plateado specimens were secured along the upper edge of the oak belt, where the oaks mix with the lower edge of the pines. None were found at lower altitudes.

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PROCEEDINGS

OF THE

BIOLOGICAL SOCIETY OF WASHINGTON

# A NEW RACE OF PINE SQUIRREL FROM THE COAST REGION OF NORTHERN CALIFORNIA.

BY OUTRAM BANGS.

Mr. C. A. Allen, of Nicasio, California, has sent me fourteen pine squirrels that were shot at Philo, Mendocino County, California, by a friend of his, who sent them to him in the meat, Mr. Allen measuring, sexing, and skinning them. This series shows the pine squirrel of the coast region of northern California, west of the mountains, to be a well-marked race. The region north of its range is occupied by *S. hudsonicus douglasi*, and in the mountains to the east is found *S. hudsonicus californicus*. The present form differs considerably from either of these squirrels, though undoubtedly it intergrades with one or both of them.

The pine squirrel of the coast region of northern California may be known as follows:

**Sciurus hudsonicus orarius** subsp. nov.

*Type* from Philo, Mendocino County, California, ♀ old adult, No. 4978. Coll. E. A. and O. Bangs. Collected Dec. 9, 1895. Skinned, sexed, and measured by C. A. Allen.

*General characters.*—Size and proportions of *S. hudsonicus douglasi;* ear small and low as in that form; colors above very dark with but little rusty; colors below varying from ochraceous to ochraceous-buff; tail dark colored with but little rusty in it and conspicuously bordered by a deep fringe of white.

*Color.*—Effect of upper parts, owing to the banding of the hairs, deep olive varied with a fine sprinkling of yellowish olive, a little rust color intermixed at base of tail, extending in some specimens onto rump; more olive gray on cheeks and top of nose; feet, hands, and underparts vary-

ing from pale ochraceous-buff to (in a few specimens) ochraceous; a broad black band separating colors of upper and under parts, usually present (in one or two specimens nearly obsolete); orbital ring pale ochraceous-buff; tail: hairs of upper surface tawny at base, then black and white tipped; of lower surface dull tawny olive at base, then black and white tipped; whiskers, black.

*Measurements.*

| No. | Sex. | Date. | Total length. | Tail vertebræ. | Hind foot. | Ear. |
|---|---|---|---|---|---|---|
| 4978 type..... | ♀ old ad. | Dec. 9, 1895 | 320. | 134.8 | 50.8 | 22.4 |
| 4987 topotype.. | ♀ ad.... | Dec. 9, 1895 | 302.2 | 131. | 50.8 | 22.4 |
| 4979 " .. | ♀ old ad. | Dec. 9, 1895 | 323.8 | 136.4 | 50.8 | 22.4 |
| 4984 " .. | ♀ ad..... | Dec. 9, 1895 | 317.6 | 133.6 | 50.8 | 22.4 |
| 4980 " .. | ♀ ad..... | Dec. 9, 1895 | 317.6 | 133.6 | 50.8 | 22.4 |
| 4989 " .. | ♂ old ad. | Dec. 9, 1895 | 327.2 | 139.8 | 50.8 | 22.4 |
| 4983 " .. | ♀ ad..... | Dec. 9, 1895 | 316. | 134.8 | 50.8 | 22.4 |
| 4982 " .. | ♀ ad..... | Dec. 9, 1895 | 319.4 | 147.6 | 50.8 | 22.4 |
| 4986 " .. | ♀ ad... | Dec. 9, 1895 | 310.4 | 131 | 50.8 | 22.4 |
| 4985 " .. | ♂ yg..... | Dec. 9, 1895 | 306.4 | 141.6 | 50.8 | 22.4 |
| 4981 " .. | ♂ ad..... | Dec. 9, 1895 | 327.2 | 139.8 | 50.8 | 22.4 |
| 5462 " .. | ♀ old ad. | Dec. 16, 1895 | 320.4 | 131. | 50.8 | 20.6 |
| 4839 " . | ♂ ad.... | July 24, 1895 | 317.6 | 127. | 50 8 | ..... |
| 4988 " .. | ♀ yg..... | Dec. 9, 1895 | 314.2 | 136.4 | 50.8 | 20.6 |

*Remarks.*—Compared with *S. h. douglasi*, *S. h. orarius* has the same small ear, but differs very much in color, the dark olive shades of the upper parts of *orarius*, with but little rusty anywhere, being in marked contrast to the ferruginous dorsal region of *douglasi*. The white fringed tail of *orarius*, with a broad black subapical band, can always be told from the rusty yellow fringed tail of *douglasi*. The under parts are, as a rule, much paler, more ochraceous-buff, less ochraceous-rufous than in *douglasi*.

With *S. hudsonicus californicus*, *S. hudsonicus orarius* scarcely needs comparison, the large ear, white or creamy white under parts, and bright ochraceous-rufous dorsal stripe of *californicus* at once distinguishing it.

Most of my specimens were taken on December 9, one only being taken in midsummer. The specimens taken December 9, show all the stages from probably the summer to full winter coat, it appearing to be the time at which that change takes place. There seems to be but a slight difference in color between the winter and summer pelages, though the black side stripes probably nearly disappear when the full winter coat has been acquired, and the ears are more tufted and the under parts more vermiculated with blackish.

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